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Rehabilitating Malagueira Neighbourhood: The conduct, public space, and water.

Daniel António Giménez Morais.

Mestrado Integrado em Arquitetura

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TECNOLOGIAS
E ARQUITETURA

Departamento de Arquitetura e Urbanismo.

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Resumo.

O presente trabalho corresponde ao Projeto Final do Mestrado Integrado de Arquitetura submetido ao ISCTE.

A água sendo recurso essencial para nossa supervivência, e como fator determinante na construção. Foi determinante na projeção do Bairro de Malagueira e tem ligações diretas com os espaços públicos principais. Os quais atualmente estão sem função pela falta de manutenção e falta de água no local.

Atualmente o bairro sofre uma falta de equipamentos funcionais, que cumpram com as normativas atuais sobre a necessidade de soluções sustentáveis. Equipamentos desde espaços públicos até plantas de produção local, seja de alimentos, águas ou eletricidade.

O objetivo do trabalho é a inserção de tecnologias atuais que contribuam a melhorar as condições de vida dos moradores do bairro. Especificamente tecnologias que incluem novas técnicas de tratamentos de águas, de forma sustentável. O trabalho foi desenvolvido durante duas fases:

A Primeira fase do projeto foi dedicada a uma investigação de obras do arquiteto, e especialmente na Malagueira. Incluindo levantamentos no local e sondagens com moradores.

A Segunda fase do trabalho, focou-se na procura de soluções a problemática atual no Bairro da Malagueira, resolução do problema com um projeto de Arquitetura adaptado as caraterísticas do Siza e o bairro.

Este trabalho, sugere a construção de uma planta de tratamento sustentável de água, na qual as águas pluviais e os esgotos serão tratadas, até conseguir um nível consumo secundário (rega dos espaços verdes, uso nos espaços públicos e águas das habitações)

Palavras Chaves: Malagueira, Álvaro Siza, Espaços públicos, conduta, águas.

Abstract

This present work corresponds to the Final Project of the Integrated master's in architecture submitted to ISCTE. The theme framed within the research project 'Siza Atlas' aims to contribute to the nomination of Álvaro Siza's works as a World Heritage Site.

Water, being an essential resource for our survival and a determining factor in construction, plays a significant role in the design of the Malagueira neighborhood and has direct connections to the main public spaces. Currently, these spaces are non-functional because of a lack of maintenance and a shortage of water on-site.

Currently, the neighborhood lacks functional facilities that comply with current regulations regarding the need for sustainable solutions. These facilities range from public spaces to local production plants, for food, water, or electricity.

This works aims to integrate current technologies that contribute to improving the living conditions of the neighborhood's residents, specifically technologies that include new sustainable water treatment techniques. This study was developed in two phases.

The project first phase was dedicated to researching architects' work, particularly in Malagueira, including on-site surveys and interviews with residents.

The second phase of the work focused on finding solutions to the current issues in the Malagueira neighborhood, resolving the problem with an architectural project adapted to Siza's characteristics and the neighborhood.

This work suggests the construction of a sustainable water treatment plant in which rainwater and sewage will be treated until reaching a secondary consumption level (irrigation of green spaces, use in public spaces, and household water)."

Keywords: Malagueira, Álvaro Siza, public space, conduct, water.

Acknowledgements.

Above all, I would like to thank ISCTE-IUL and its teaching staff, who have accompanied me for the last five years on this professional training path. This is a teaching staff who, in addition to their role, also teach human values daily and help to guide us on our path as people and professionals.

I would like to thank Professors Soraya Genin, Teresa Marat-Mendes, and Pedro Pinto, who have accompanied me in the development of this work for the last year.

Other teachers who have marked my journey as a student and who need to be thanked are the project teachers, I had each year: Gabriela Gonçalves, Filipe Magalhães and João Carlos Lopes, Pedro Mendes, João Ventura Trindade, Inês Lobo, and Miguel Judas.

I'd also like to thank my year and classmates; we've been on this journey together for 5 years now and the support I've received since day one has been one of the main supports in my adventure of doing a course like architecture in a culture I didn't know.

Most importantly of all, I want to thank my parents and siblings, who have been the main support in this story. I would like to thank them for believing in me, for helping me throughout my process, and for putting up with all these years of distance, which is not easy for a family as close as ours.

To my friends who have become family. I arrived in Portugal alone and I can now say that I have a family here for the rest of my life. They have been my emotional and physical support in recent times and are an essential part of the person I am today.

My Portuguese family, who have been watching my every move were essential in the process of adapting to the country in my early years. As well as my lifelong friends, who have not been there to experience this growth with me, but who have been present every day for many years and we have been growing together.

Lately, I want to thank myself for not giving up despite the difficulties, for having endured every bad moment, and for making the most of every good moment. It's been a journey of ups and downs and I'm proud of the person I've become.

Introduction.

Álvaro Siza is the most prominent architect in the history of Portuguese architecture. His architectural development and design skills have taken him to various places and cultures around the globe to solve challenges through his artistic approach. Residential architecture was one of the most developed themes in his career.

This focus on residential architecture has driven Siza to adopt a working methodology that involves immersing himself in local life, aiming for a deeper understanding of existing problems and local culture. His working methodology remains to be studied to uncover how architects synthesize problems and solutions to achieve highly precise design results.

This was no exception when Siza was commissioned to design a residential neighborhood located west of the city walls of Évora. This is how the Malagueira neighborhood project began in 1977, following the approval of a municipal plan for the region. Siza designed residential blocks interconnected with “the conduct”, which created a protected pedestrian passage and supplied blocks with water and electricity.

The central space between the blocks was designed as the main green space, providing a high-quality environment for the residents’ daily lives. This green space is crossed by a watercourse, which is sometimes visible on the surface or underground.

The main watercourse was used to create the Malagueira Lake, providing a direct connection between water and the inhabitants of the neighborhood. This watercourse passes through the main garden (Jardim dos Socalcos), a space intended for the contemplation of water, which is no longer working.

Water undoubtedly played a fundamental role in the conception and planning of the neighborhood, both in construction and for the well-being of the residents.

Currently, the relationship and functionality of water are not as evident or experienced by the residents. Current climatic conditions have led to a lack of water and heat in Alentejo region, further complicating this relationship.

As a respond to this problem, I have projected my final architecture project. To give ideas for new solutions.

This work is part of the research project SIZA ATLAS. Filling the gaps for World Heritage, which the objective of contributing with the candidature of Siza´s works as World Heritage.

Research question

This study aimed to answer the following research questions:

How can Malagueira be sustainably rehabilitated to recover the importance of water in public spaces and ensure the best quality of spaces for the residents.

Objectives

The main objective of this project was to provide new functionality to the sewers and rainwater. While recovering the meaning of this element and its connection with the people.

As contributing to the principles of sustainable development needed in the actual formal plane of the area.

Within the scope of this project, a plan is proposed to channel rainwater and sewage to treat and reuse it for later use as a reserve in the agricultural system of the surrounding area.

Methodology.

This work envisages a multidisciplinary approach in four phases, interconnected by a continuous study and development of different themes addressed within the neighborhood by different students in Class 4 of the master's dissertation.

First phase: An analysis of different works by architect Siza was carried out. This analysis was complemented by critical texts on literary works by the architects. This phase aimed to understand the design principles and get to know the architect.

In the second phase, an on-site survey on the state of conservation of the Malagueira neighborhood was conducted. This survey was complemented by a bibliographical analysis of the historical-geographical context of the area and a search for documentation in the C.M.E. archives.

The third phase was on-site work to analyze the living conditions of residents, housing, and public spaces. While choosing the intervention area for every individual work.

The fourth phase is the proposal of a project, to bring new solutions for problems that have not yet been dealt with or did not exist at the time the neighborhood was designed and built.

Structure.

This work was divided into 5 chapters.

The first is about Alvaro Siza´s study cases we analyze, which are considered some of his best work. Here are revealed some principles he repeats in his working methods, this helped to organize and understand his conceptual process closer.

The second is about the actuality of the Malagueira neighborhood, the on-site work was the first start of the project where we could realize the real condition of the buildings, social areas, and the personal opinions of the residents.

The third is about the conception and characterization of the most singular element of the project: The conduct studied for its function as a services distributor and even deeper as a space character in the neighborhood.

The fourth is the study of the water treatment techniques we chose for the project. Explained in a detailed way, we also explain the pros and cons of our system getting to the conclusion of why it was the chosen one. This part also contains the tank calculations for the needed area.

The fifth and last is exposing the final design of the project, including the final tank final design and the new function for the new buildings where the tanks are located. As for the public spaces created for the complex.

ÁLVARO SIZA

The following chapter was written as an analysis of some class activities assigned during the year. The first exercise was an individual activity, consisting of the interpretation of Siza´s texts, this analysis is made in the *Analyzing Siza* part. The second analysis was based on the recompiled information by the class, which led to the creation of two books. (Livro 01 Siza) (Livro 02 Malagueira) The *Study Cases* part was based on these books.

Analyzing Siza.

The first exercise of the year was an interpretation of Siza´s text #1. The texts were distributed between the classrooms, following related subjects assigned to each student. Mine was the city. So, I title my text as *Siza´s city.*

The bibliography for this work is the book:

(01textos, 2009, pp. 19, 31, 51, 55, 59, 117, 119, 137, 139, 141, 151, 171, 201, 255, 271, 297, 309, 313, 323, 343)

"Siza's city:

Álvaro Siza is an architect who understood from the very beginning of his professional career that the city is the starting point for working in Architecture as understanding what is needed to function, the city is formed by different elements that are in a constant search for a peaceful coexistence.

Through Siza's writings about the cities, I have come to understand the most important aspects he has retained from his countless travels and how they have served as the common point for the architectural work he has developed, on every possible scale.

According to Siza´s point of view, cities everyday life is about chaos, and many people gather in small spaces where we must live together. This situation leads to social shock. Life in cities is always seeking balance, and the architect is responsible for achieving this balance.

The architect's role in the city is fundamental, not only to improve people's lifestyles and create a balance between new and existing cultures but also between main spaces and normal city streets.

We live in a time when the city is an uncontrollable space, and we need to make changes because we cannot control everything. Architecture is about making a difference from normality and being as discreet as possible, always rigorous in the decisions we make.

Changes in today's world have led us to forget the origins of places. Similarly, it is fascinating to live with many cultures around us. It is not about doing too much, but doing it simply, and with that simplicity, trying to reflect the feeling of maximum freedom in people's lives.

On the other hand, it is important to realize the limitations that the city gives us, both physical and climatic, which must be understood as much as possible to work with them to make the most of the situation.

An example that Siza uses in his texts on this subject is the city of Rio de Janeiro, which he describes as a city designed and built to dance subtly with nature and the waters around it.

“Gostaria de ser arquiteto no Rio de Janeiro.

Quando se comete um erro, imagino, logo a natureza acorre. Dos terraços e das janelas e das portas, do primeiro ao vigésimo piso, rebentam folhas, flores, ramos, enlaçando casas e penhascos. As ruas são cobertas pelas copas das árvores, as trepadeiras crescem sobre as fachadas e escarpas, amaciam a violência da luz e das formas”. (Siza A. , Rio de Janeiro, 2009)

He praises Brazilian architects who worked in this city for their constant quest to bring nature into the city and people's daily lives. The fascinating thing is how the contrast of the brutality and detailed construction finds a balanced and let nature be protagonist.

This coexistence between nature and the city is one of the sought-after qualities in the development of today's cities. City designs go hand in hand with nature.

Together with the functionality of our daily lives, create the city, and we seek to solve them in creative ways to give characters different solutions.

Finally, we are building cities and people. We must solve things in the most organic way to improve the quality of life of those who inhabit this space."

The architect's perspective on what it means to live in cities and what intervention entails is soon understood. Strong design principles are described in the previous text, which are the same ones that are present in Malagueira.

“A transformação da cidade é de fenómeno natural e prova de vitalidade, se de acordo com as suas necessidades, ou seja, com as necessidades coletivas do cidadão.

E uma das necessidades coletivas consiste na vivência quotidiana dos resíduos da história de que é feita a cidade, contributo fundamental à consciência da história e do devir.” (Alvaro, a cidade que temos)

Reflecting about the city gowns, a natural process consisted in the cotidiam function and collective needs.

These ideas are essential in Malagueira House Design.

Study Cases:

These works were essential to understand how Siza looks for problems to create design opportunities. Developing projects of such importance implies a very respectful way of intervening.

Chiado´s reconstruction plan.

"The revitalization program promoted the recovery of commercial and housing functions and the modernization of cultural facilities. The transformative interventions involved defining the program, accessibility, and organization of the commercial and equipment front. It was realized that housing and other uses had to be rehabilitated to allow the complex to function properly" (Siza A. , Reconstrução do chiado e Suícidio entre os Jovens., 1990)

"The Siza Safeguard Plan (II) differs little from the initial idea defined in the Pombaline Downtown Plan (I). Adaptations were made because of new premises and a better understanding of reality." (Siza A. , Reconstrução do chiado e Suícidio entre os Jovens., 1990)

The principles of the project were explicit and the whole project where thinking with them on mind. (Gomez, 1994)

"The project reintroduces the idea of the cage, now in concrete, and restores all the façades that were spared by the flames. Doors, and cornices were also rebuilt, restoring them to their original condition. Changes were only made when it was necessary to improve comfort. To ensure thermal insulation, for example, two windows were used in succession, thus preserving the delicate profiles of the existing windows." (Castanheira S. a., 1997)

"There won't be, looking at the plan straight away, there won't be anything new. I even remember that, at the first public presentation, someone said to me, looking a little disappointed: "But it's all the same after all." What isn't the same doesn't have to do with the architecture or design, but with the organization, the program, and an aspect that the city council put into the program, which is very important, which is accessibility, the relationship with the surrounding areas." (Alvaro, Chiado em Detalhe , 2013)

"Well, we kept the façades the ones that didn't fall and the ones that did, we're going to rebuild. So, the façades are the same."
(Siza A. , 1990)

Organization.

"We've distributed a program that includes 30 to 40% housing, so that's a big change. As you know, Chiado was deserted at night... In concrete terms, the last two floors of the buildings are for housing." (Castanheira S. a., 1997)

"To talk about housing, it was necessary to improve the health conditions. The buildings on the west side of Rua do Carmo had a wall behind them supporting the Veiga Beirão school. And a courtyard reduced to almost nothing. So, it's necessary to reduce the size, the depth of the houses, so that there's cross ventilation, light, good living conditions." (Siza A. , Imaginar Evidencia. , 1998)

"Another important aspect that significantly alters the atmosphere of the area is the fact that there is, or will be built, a metropolitan station, for Cais do Sodré and a station at the intersection of Ivens and Garret streets. From there, there is a level underground gallery that comes out onto Rua do Crucifixo. This means that this street, which used to be a secondary service, in a way becomes the place where everyone leaving Baixa or arriving in Baixa converges to access the metro." (Siza A. , Imaginar Evidencia. , 1998)

"Well, I still think it's decisive; it's underway, it's already being finished, I think it will open in '98 and it will probably be the most important element in the transformation." (Castanheira S. a., 1997)

"The changes were mainly to the access points. For example, there was to be access in the center of Block A, but this is no longer going ahead, at my suggestion, because it turned out that the space occupied by the elevators was too large for the size of the courtyard". (Gomez, 1994)

The result of a more complex public spaces appears, als with tranformant innovation as it was the Metropolitan for its time. This project marked a new way of interpreting the pombaline center, in its most natural way.

Intersection of these two streets

"To locate a little: here we have the Santa Justa elevator; Carmo; this is Rua Nova do Almada; Rua Garret, so Rossio on this side; here is the Espírito Santo da Pedreira convent, the old Chiado warehouses; and Grandella and here Rua Garret. So, the buildings destroyed by the fire line up structured by this intersection of these two streets." (Siza A. , 1990)

These two streets are the most important in commercial and industrial terms, Siza thought about them as a complex, having the opportunities to re-distribute the buildings.

A new design

"The only rupture in the very regular relationship between the Pombaline buildings in Chiado and outside Chiado, the only rupture appears for very strong reasons, which are the access to these new courtyards and the access, the very access to the metro. There will be a movement in the relationship between the street and the façade, which is new, a large flow of people, so we present a new design where there is a break in the Pombaline rhythm." (Castanheira S. a., 1997)

This new design helps the reinterpretation of the space of the people. Most of the urban spaces feelt the same but with this new path the diversity of spaces also grows, making a more complex area.

Espírito Santo da Pedreira Convent/Hotel:

"It's a very strong building and in this building what we have to do is reinterpret it, I'm not thinking of redoing the baroque interior, but reinterpreting it while maintaining the interior spatial structure. And the program that can be adapted, in this case, to a building like this, is the hotel." (Alvaro Siza and Carlos Campos Morais., 2009)

Most of the adapted spaces of the buildings maintained their function in the recent years after the intervention. Nowadays is rare to see an original interior designed by Siza but during the visit, we had to chance to meet one. Figure 1Figure 2 Figure 3Figure 4Figure 5

Figure 1. Apartament in Chiado. By author.

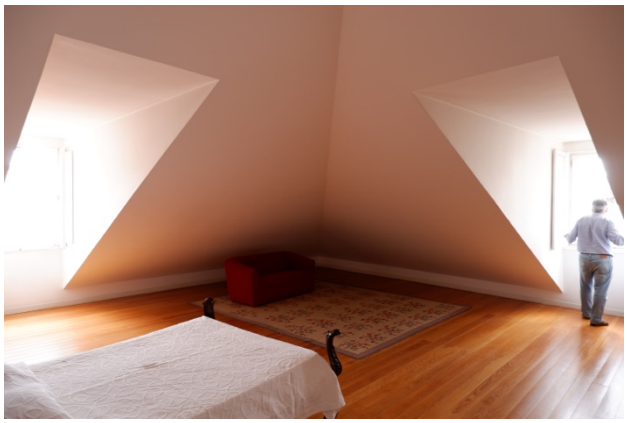

Figure 2. Apartament in Chiado. By author.

Figure 4. Apartament in Chiado. By author.

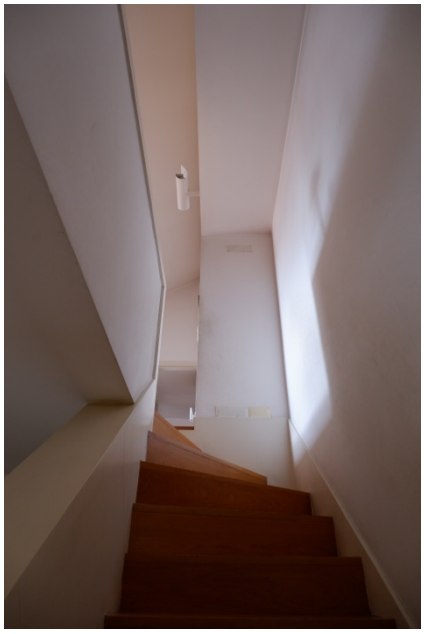

Figure 5. Apartament in Chiado. By author.

Figure 3. Apartament in Chiado. By author.

Escola Superior de Educação de Setúbal:

This design interprete a game in full and empty spaces, where he takes advantage of the empties to create access and light entrances. As well as to create a continued balance between the interior and exterior light in the building. (D, 2007)

“The U-shaped building benefits from the existence of two courtyards of different sizes flanked by irregular bodies. The entrance courtyard, facing southwest, creates the school's social area, surrounded by the teachers' rooms, access control, library, administration, bar, and cafeteria. The other courtyard opens to the northeast and is generated by two wings of exterior galleries, with two floors that are distributed among the classrooms.” (Alvaro Siza and Carlos Campos Morais., 2009)

Making the exterior more present in the interior:

“The reinforced concrete and brick construction, with white painted plaster, highlights the contrast between the pure, slender lines of the building and the still very rural surroundings.” (F.M., 2007)

“Throughout the school, the strong presence of light is also noticeable, as there are several skylights in various rooms of the development, or very tall and long windows, which give a sense of the outdoors through the light they let in” (F.M., 2007)

The columns facing the main courtyard take on different shapes but are always made of concrete. (F.M., 2007)

The principles of the project were:

“The project adapts to the existing nature and has even changed location to maintain the existing trees on site and respect the outdoor space.” (F.M., 2007)

In the middle of a natural implantation, the school design takes advantage of that while creating its own spaces. All complemented by the outside.

“The new buildings are part of a university complex, each building fulfilling a different function. In the case of this building, the combination of courtyards it creates, in contrast to

the isolated classroom spaces, gives students the freedom to change spaces within the same building." (F.M., 2007)

Besides being complex, all the volumes have autonomy, and the programs are divided on them.

"The spaces are located perpendicular to the central axis of the building's main atrium and manage to create transversal spaces for the different programs such as the library and the dining area." (Margarida, 2009)

Different paths ensure continuity of route and connection between the different volumes of the building, between the existing buildings, and the surroundings.

"The complexities of the paths make it possible to create different routes. From the main entrance volume, which creates access from the railway line and the buildings. The entrance to the interior is made in different ways, through the front patio, which gives direct access to the canteen and library, or through the courtyard of the classrooms, which connect with corridors in the two wings of the building. There is also a direct entrance to the second floor via the external staircase, which is isolated from the main building." (D, 2007)

The complex is distinguished by volumes that identify each space; the main U-shaped courtyard integrates the administrative spaces and classrooms. The front courtyard is bordered by the canteen and library and marks the entrance to the building. Two volumes stand out on the left: the gymnasium and the auditorium. As is also the case with the main facade, the volumes of the central entrance and the stairwell also mark their independence from the building. An isolated pink volume marks the entrance to the right side of the building." (Alvaro Siza and Carlos Campos Morais., 2009)

The volumes together create a white complex that adapts it forms to the natural spaces. The balance of the spaces is made in a deliciated way, and the limits are well marked (Figure 6) with walls and some complementary structures (Figure 7)

Figure 6, door, by author.

Figure 7. Main Entrance by author.

Figure 8. Individual, by author.

Figure 9. Garden. by author.

Figure 10. Gym Roof. by author.

Figure 12. Window. by author.

Figure 11. Side view. by author.

Figure 14.Interior patio, by author.

Figure 13. patio entrance. by author.

Adega Mayor

Adega Mayor" is in Herdade das Argamassas, far from the city cevnter in an area of clay soil, ideal for a vineyard. It is located on the land at a strategic point that connects the three levels of the land. It is a three-story reinforced concrete building, rectangular (120 x 40 m). The cellar space is described as:

"The white volume in the open countryside of the Alentejo landscape is marked by its isolation. The cellar relates only to the surrounding nature, there is no need for it to relate to another building, as it is the only presence, thus conveying a sculptural force. In addition to this perception, the justification for the building's location is, according to Álvaro Siza, due to two guiding design elements: the pre-existing road that connects the industrial complex to an outcrop of compacted clay, and the organization of agricultural activity. The winery takes advantage of the centralization of the building of the vineyard so that the distance covered in transporting the grapes is uniform for any part of the production. The lack of interior-exterior relationship and natural light on the blind façades is compensated for by the predominant openings on the southwest and northeast façades, gaps between floors as well as the variation in altimetry". (Grilo, 2022)

The space is topped off by a landscaped roof that articulates with the landscape, creating a place of permanence that retains moisture inside the winery and creates a humid environment.

The winery was built on top of topography with an architectural language and play of colors that are in keeping with the local architecture. (Margarida, 2009)

Besides the project is a private one, it merges with the most tradition architectural styles from the region, not only to maintain the balance but also to take advantage of the constructive

morphology of the region. Preventing problems with the weather or climate conditions. “The building has large, glazed surfaces on the southwest and northeast façades and receives very strong sunlight throughout the day. The water tank and landscaped terrace help to preserve the humidity and temperature inside the winery.” (Livro PFA, 2023)

The roof area creates an autonomous space but is controlled by natural conditions. Still, the structures walls hide inside the big Adega which has more controlled conditions.

Access is marked by the southwest façade which leads to a lobby that separates the production area through translucent glass, enveloping the social part of the building with the functional part. The transition from the production area to the social area is a rough one in which we move from a large, serene environment to a smaller, more comfortable one. (Livro PFA, 2023)

The cellar has a rectangular geometry measuring 40 x 120 m. It is located perpendicular to the contour lines at the top of a topography. Its exterior is mostly white plaster in keeping with the regional architecture. (Grilo, 2022)

The view from the roof almost looks like the naural landspace of the region. Figure 16

The building is attached to the delta café factory, thus giving it continuity. The building has a lobby on the first floor connected to the double-height production area, then transitions to an intermediate floor dedicated to the employees and later goes up to the terrace with a landscape character made up of nature and water. (Grilo, 2022) Figure 15

This project is a comprehensive one as it adheres to the necessary guidelines for both urban and restoration projects. Nevertheless, the structure developed here functions independently and can chart its own course, establish unique environmental agreements with the surrounding region, and adapt to the dryer and hotter climates.

Figure 15. Roof view. by author.

Figure 17. Roof View. by author.

Figure 16. Roof water mirror, by author.

Portugal Pavilion

“The building is in the former industrial area, now known as Parque das Nações. It is surrounded, on the one hand, by the river Tagus and, on the other, by the railway line and the contemporary architecture of works such as Gare do Oriente (1998), by Santiago Calatrava.” (S., 1999)

“The former is covered by a large curved concrete sheet supported by two porticoes perpendicular to the quay. The "Pala", as it is commonly known, is an unforgettable architectural element in the building as a whole and in the composition of the square, but it also represents a remarkable work of national engineering.” (S., 1999)

In this field, engineer Segadães Tavares was a key figure, creating a suspended membrane just 20 centimeters thick and 67.5 meters long between the two suspension points. This element is made of lightweight aggregate concrete, reinforced with high-strength steel cables.

The second volume is located to the north of the Ceremonial Square and is divided into two floors, comprising the reception area, exhibition and restaurant, and a basement, where the remaining services are located. (Afonso, 1998)

Light enters the building through regular openings in the façades and two different patios: one central and the other to the north of the building. Both are design options that foresee the possibility of changing the original use of the building (exhibition) to another that requires the subdivision of spaces.

In this way, as well as through the strategic location of the vertical circulation in the building, Siza guarantees its flexibility without compromising its functioning.

The structural composition of the building is mixed. The periphery and contours of the courtyards are made up of reinforced concrete structural walls, and inside there is a system of metal columns and beams.

Project principles:

"There's a discourse with the river that doesn't have to do with being Portuguese, but with geographical position. Some marks go beyond us, there's no point in making special efforts to explain them." (Afonso, 1998)

"So, without knowing how to handle it, I thought of moving the building, taking it away from the axis of the dock and placing it in a position of asymmetry, anchoring it to one side of the dock. As if it were a boat." (Afonso, 1998)

-Signs of the Nation

"The exterior space of the Ceremonial Square was to be white, but together we concluded on the importance of having a sign there. So, we came up with a caravel and the word Portugal written in the 16th-century and contemporary way." (Afonso, 1998)

"The choice of color and material for the interior wall of the Ceremonial Square was not simple. I've been very interested in tiles for a while, it has to do with my interest in drawing, and so I thought that in this case, it was a material to use. The tile is a material that is linked to the history of the city of Lisbon, but today it presents difficulties." (S., 1999)

The tones applied to the tiles (red and green) also immediately refer to one of Portugal's main symbols: the national flag. (Afonso, 1998)

-Horizontality of the building

"The strategy for designing this building was, after realizing that the other buildings in the enclosure had a certain ambition in height, to emphasize horizontality, to bet on the reflection in the water" (Afonso, 1998) (Futagawa, 1998.)

-Imposition on the city

"I was obliged to design a building that was very flexible, but that had a firm image and would eventually play an important role in the city." (Trad.) (Futagawa, 1998.)

"Before, the building was on the other side of the street. But since I didn't know what the other buildings would look like around this axial situation, which requires symmetry, what I did was create an asymmetrical situation." (Trad.) (Futagawa, 1998.)

This building marks his presence in a new area of the city, it doesn´t do it because of it size but because of its emptiness. This calm creates this feeling of imposition and respect.

-Position of vertical access
"I placed the vertical accesses next to the courtyards, at the four corners, so that people could be comfortably distributed throughout the spaces." (Trad.) (Futagawa, 1998.)
-The exit from the building
"The relationship with the outside is not something minor, it is inseparable from the project. For example, at the exit, there are walled gardens that extend the building on the one hand, but which are, on the other, a more natural way for each of the visitors to dilute themselves in the enclosure in the various possible directions." (Afonso, 1998)

-Multiple Uses
"There is a part of the work in which the development and arrangement of the program becomes like organizing the internal space in another building. You can now work in an almost isolated way on the division of interior spaces destined for what you don't know later." (Afonso, 1998)

-Modular structure

"The structure is very flexible. There was a system of walls throughout the building and the ceiling was suspended. It's all related to the fixed module developed for this building" (Futagawa, 1998.)

-Light entrances
"If the option is to use this space for offices - as opposed to a museum - the pavilion has to be broken up into smaller rooms. This possibility has led, for example, to the appearance of courtyards ... The great depth needed for the immediate purpose - Expo'98 - in the future could limit the light entering the building, hence the construction of two courtyards and a very regular placement of windows." (Afonso, 1998)

Siza's water-related works.

Álvaro Siza Vieira is known for his sensitivity to landscape and context, and water often plays an important role in his projects, influencing the design and interaction with the environment. Here are some examples of how water has influenced some of his projects:

Portugal Pavilion at Expo 98, Lisbon, Portugal:

This pavilion was built on the banks of the Tagus River and stands out for its relationship with water. Siza designed an entrance that seems to float on water, creating a visual and physical connection with the river. Water played a fundamental role in the design of this building, providing a serene and reflective environment.

Its connection with the water is more than something physical, its position make it look like a boat next to the river. As well as it has a similar position to Portugal has with the Water. It was supposed to be near the principal of the axil, but the intervention changed. Figure 18

"The strategy for designing this building was, after realizing that the other buildings in the enclosure had a certain ambition in height, to emphasize horizontality, to bet on the reflection in the water" (Afonso, 1998)

The meaning of the water in this work literally changed the original plan. The strong element can limit the monument and contribute to the purpose of the space. Located next to the “Pala” it creates a continuous feeling of horizontal emptiness and calm.

Figure 18. Portugal Pavilion water side, by Fernando Guerra.

Piscina das Marés, Leça da Palmeira, Portugal:

This is an outstanding example of how water directly influenced the project. The Piscina das Marés is a seaside pool that Siza designed to merge with the rocks and the ocean. The seawater is an integral part of the project, creating a unique experience of interaction between the natural environment and the urban one.

This relation is a big contrast, so it is what Siza tries to transmit. He creates an entrance to the pools to create a clear distinction between both spaces. The building takes a horizontal plane and is not even possible to see it from the urban streets: (Figure 20)

"*Álvaro Siza builds an alternative reality and fictionalizes a landscape, using the building as a rite of passage between two worlds. First, it marks the passage from a world imprisoned by vernacular roots, which were intentionally rediscovered as a new legitimation of modernity, and of which the neighboring Boa Nova Tea House is a paradigm, to a world that, no longer relying on regionalist support, assumes the heritage of references from the history of architecture to build and reinvent Contemporaneity."* (L.M, 2022)

The pools mark the limits of their territory and the natural stone, as well as making a passive transition between the urban and natural environment. These limits also reflect the consequences of that moment with all the urbanization construction and the end of the rural lifestyle. Figure 19

"The Swimming Pool is all that. It is an 'eschatological beyond' because it reflects on the end of a time, and eschatology is understood here as the theory of the things that will happen a! er the end of the world, a world that, by the time Siza designed the Pool, had come to an end, not only the time of heroic and saving modernity, but also the space of a disappearing rurality" (L.M, 2022)

Marking more than a Historical intervention, a conception and deeper meaning that a simple view maybe is not well appreciated.

Figure 19. Piscinas de Marés. by. Fernando Guerra.

Figure 20. Piscinas de Marés by. Fernando Guerra.

Sobre a Água / Álvaro Siza + Carlos Castanheira

This project was done in 2014 when Siza was 88 years old, his maturity in this projection is visible to an open eye. In this case, the building is in an artificial lake which also works as a water reservoir of 100.000m2 of water. Is in the New Salt Industrial Park house of Shihlien Chemical Industrial Jiangsu Co—one of the biggest chemical centers in the world.

The architect was assigned to project an office building on the water. The form of the building goes up to 300 meters long and its constructed area is up to 11.000m2. The architect worked especially[1] in the mix between the water and the building. (Castanheira, 2014)

In this project, we can find common characteristics and principles Siza followed for the other water-related works.

Crossing curved geometries, and bridges that connect different spaces, floors, and volumes. The project takes advantage of its poetic setting and natural illumination. (Machado d. S., 2017)

In constant interaction with the environment—whether in the changing tones and reflections of water or the levels of light and shadow—the building incorporates external changes. (Machado d. S., 2017)

Viewed from land, water, or air, the elegant structure conveys a silent beauty achieved in its fullness when the concrete—substantial—encounters the fluid—ethereal. (Machado d. S., 2017)

As well as its design process uses the existing to create relations and alignments.

"Twisting away from the conventional, the building becomes a complex entity that contrasts with the orthogonal forms of the factory complex," according to statements by the Shihlien Group regarding the design of the Waterfront Building. (Machado d. S., 2017)

[1] " (Castanheira, 2014)

Figure 21. Edificio Sobre a água. by. Fernando Guerra.

Conclusion.

The study cases were the first approaches to Siza's design, projects of different scales, functions, and periods. They are essential for our understanding and our way of looking at Siza and his work.

With them I understood better the limits and restrictions you must follow while building in an architecture work like Malagueira. They also gave me ideas of what Siza could be trying to transmit in the different spaces he created.

Organizing and comparing these examples made me conscious about the level of impact my project needed to have to serve as a good complement for Siza´s project.

The importance of the works commissioned to Siza also shows the trust and respect that this character conveys to the world´s politicians and investors. From the restoration of the historic center of Lisbon to a vocational school and a wine production facility, and even to main buildings in the Oriental world.

In this way, we can find common ground, but when we look at the principles of the project, we understand how the design was conceived to solve programs by creating relationships with the existing.

It uses different autonomous, complementary bodies, creating a world of its own occupied by the new functions.

MALAGUEIRA

Evora and cartographic analysis:

The region of Évora is part of a peneplain which, to the south, is interrupted by low reliefs, apart from the foothills of the orography between Montemor-o-Novo and Valverde, which extend as far as S. Bento (364 m), to the west of the city. (Tereno, 2015)

Opposite this relief, on a northwest-southeast alignment, is the city of Évora, on a rounded elevation (310 m) where, from a geological point of view, eruptive rocks predominate. To the east of the city, there are some reliefs of metamorphic schist that reach an altitude of around 280 to 290 m (Feio, 1993)Figure 22

The morphology of the region is not very busy, with gentle slopes and wide valleys, integrating three hydrographic basins, the Sado, Tejo and Guadiana rivers, which drain areas of approximately 7640 km2, 24800 km2, 11800 km2 respectively, in Portuguese territory. (Feio, 1993)

The Xarrama, Degebe, Peramanca, Valverde and Viscossa streams are the main watercourses in the area surrounding the city, with irregular regimes due to their close relationship with the climate of the region in which they are located and the low permeability characteristics of the dominant rocks. The Mediterranean climate prevails in this region, characterized by a wet, cool winter and a long, hot, dry summer. (Tereno, 2015)

In 1715, a printed engraving depicting the city of Évora by the cartographer Van der was published in Leiden. This iconography shows a well-defined section of the arcade of the Agua da Prata Aqueduct, between the outer wall and the Convent of Santo António da Piedade, a religious house of the Capuchos Order founded in 1576. Figure 23

From the route inside the walls, there are cartographic elements of notable relevance that have allowed proposals to be made for reconstructing the old existing water supply route, which was mostly located underground. Figure 24

Figure 22. Evora plan. Torgela Watercourse marked on the left. [ink drawing, watercolor, on canvas]. [1750-1790] by. CME.

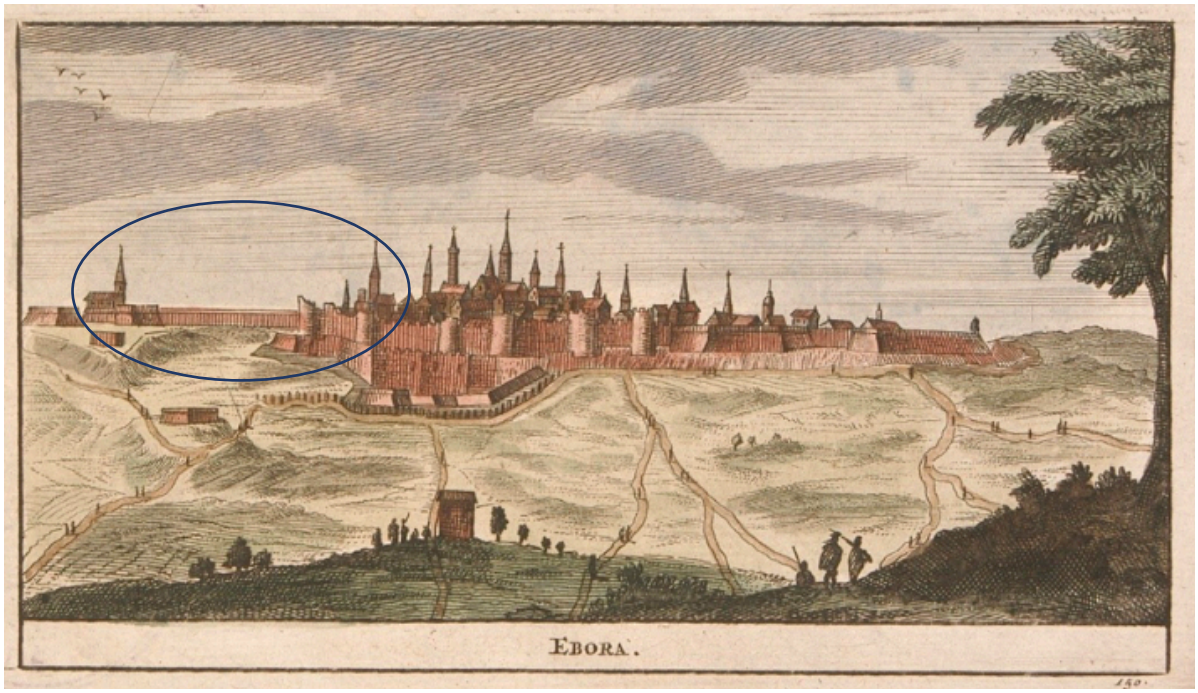

Figure 23. Engraving Depicting of Evora, showing the Aqueduto Agua de Prata. By: AA, Van der.

From the route inside the walls, there are cartographic elements of notable relevance that have allowed proposals to be made for reconstructing the old existing water supply route, which was mostly located underground. Figure 24

In the plan referring to the open spaces inside and outside the wall (Fig. 24), water is seen as a precious commodity in the event of an enemy attack, and all the supply points, as well as the structural layout of the aqueduct, are represented with great precision, probably for military purposes. (Tereno, 2015)Figure 22

The western surrounding area of the city is where the Malagueira plan took place. This place is characterized as being the beginning of the foothills of the topography between Montemor-o-Novo to the west of the city. So, there is a light difference between the heights and the lowest part of the terrain. Figure 25

Besides this altitude difference, there is also the main natural barrier which is the Torregela watercourse which delimits the neighborhood limits in between. (Futagawa, 1998.). The other limits of the area were the existing neighborhoods, Like Santa Maria, Cruz Picada, and Senhora da Gloria. Figure 27

The first step to make the area habitable was to create a sewage network for the new neighborhoods and the existing ones. Figure 27

This sewage system was part of a city sewage system plan. This plan organized most of the sewage in the city into the same ETAR, this treatment water plan is a conventional system and nowadays treats nearly 80% of the sewage water of Evora. Figure 28

These existing conditions create the spaces and conception needed to start the project. The Torgela watercourse is one of the most important in the region, it´s merged with two watercourses in the lowest point of the Malagueira´s area. This is why the Malagueira Lake was able to exist. (Futagawa, 1998.)

This watercourse also denominated what is called the big central space. To create a natural area to respect the watercourse, the plan for the project exited 1/3 of the area without construction. Siza plans to use these green spaces as one of its main ingredients for the design. (Futagawa, 1998.)

The old aerial pictures help us to localize the constructed areas before Malagueira and the Torgela watercourse. Figure 26

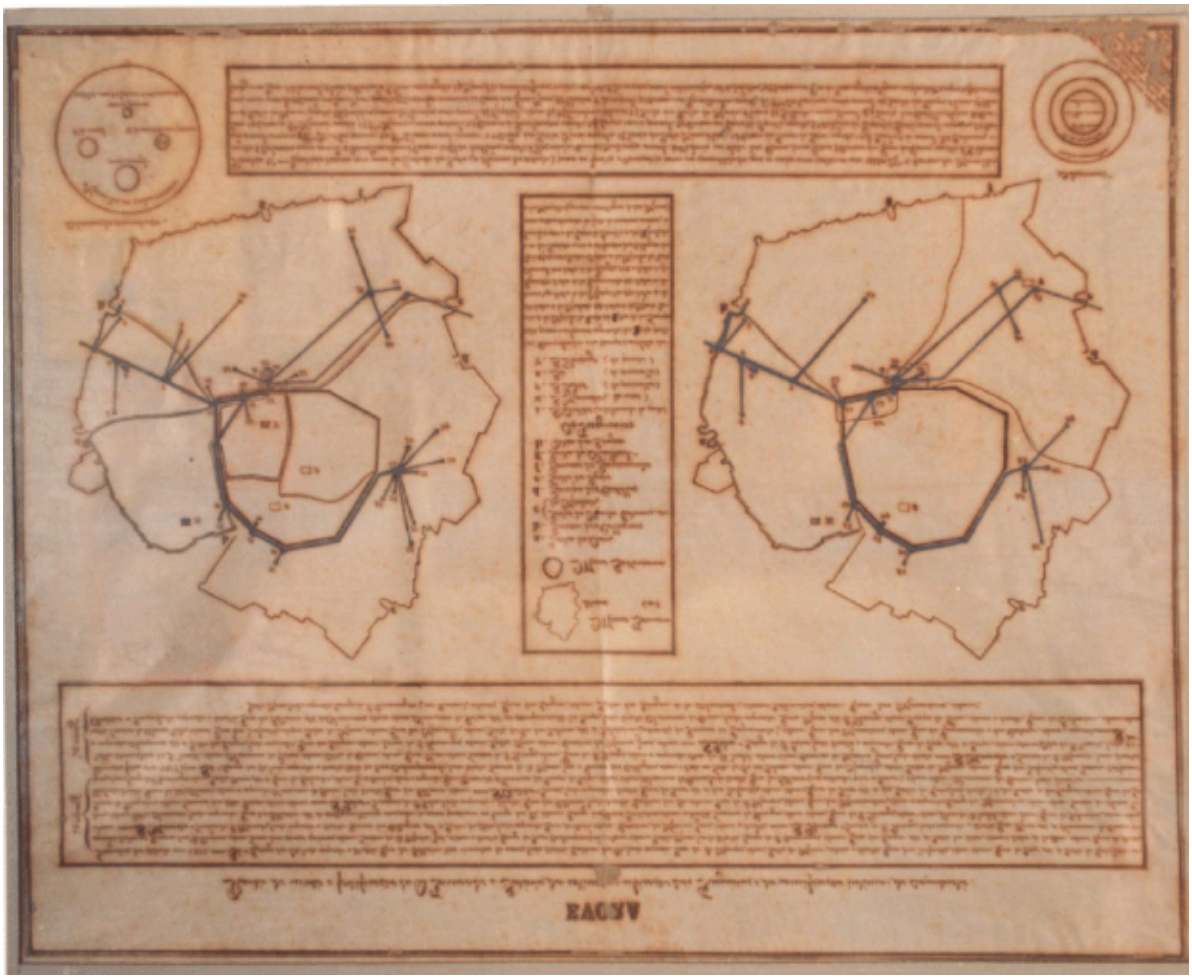

Figure 24. Inside walls old water supply in blue.. (1900) By. CME

Figure 25. Malagueira´s area and lowest point were selected. By author.

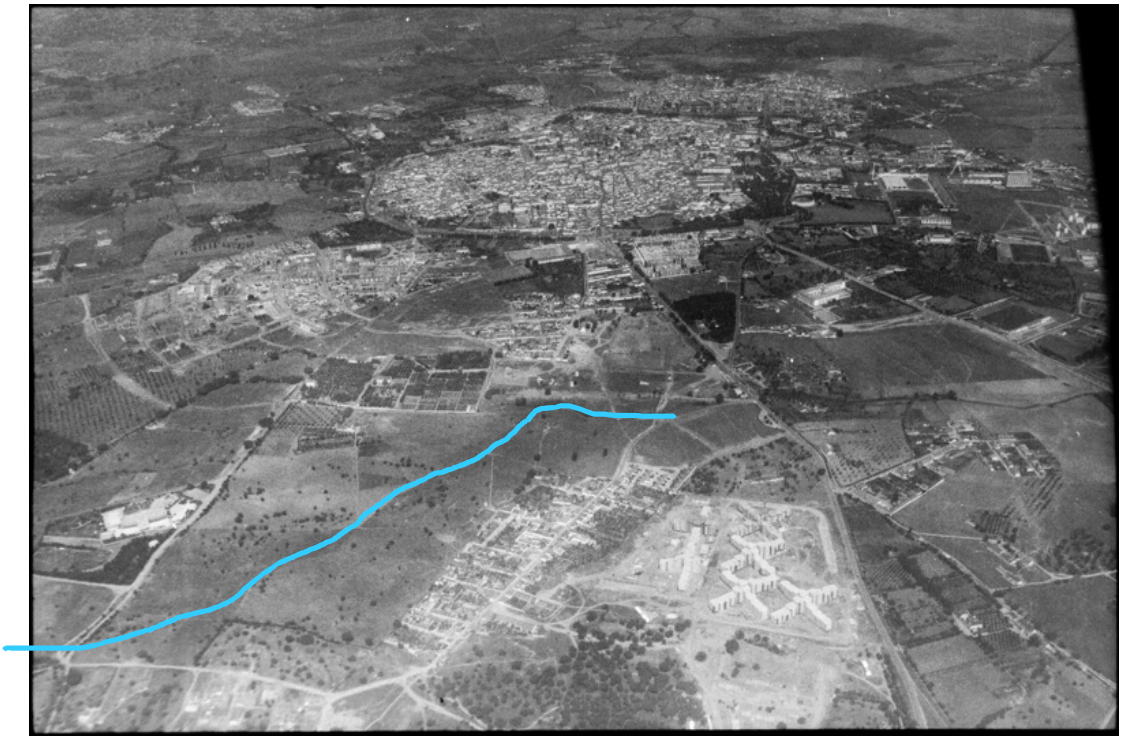

Figure 26. 27hc terrain for the Malagueira, before construction. Torgela Water Course in blue. By CME.

Figure 27. Sewage network plan. Santa Maria in red, Cruz Picada in green , Senhora da Gloria in yellow and Malagueira in blue. By CME.

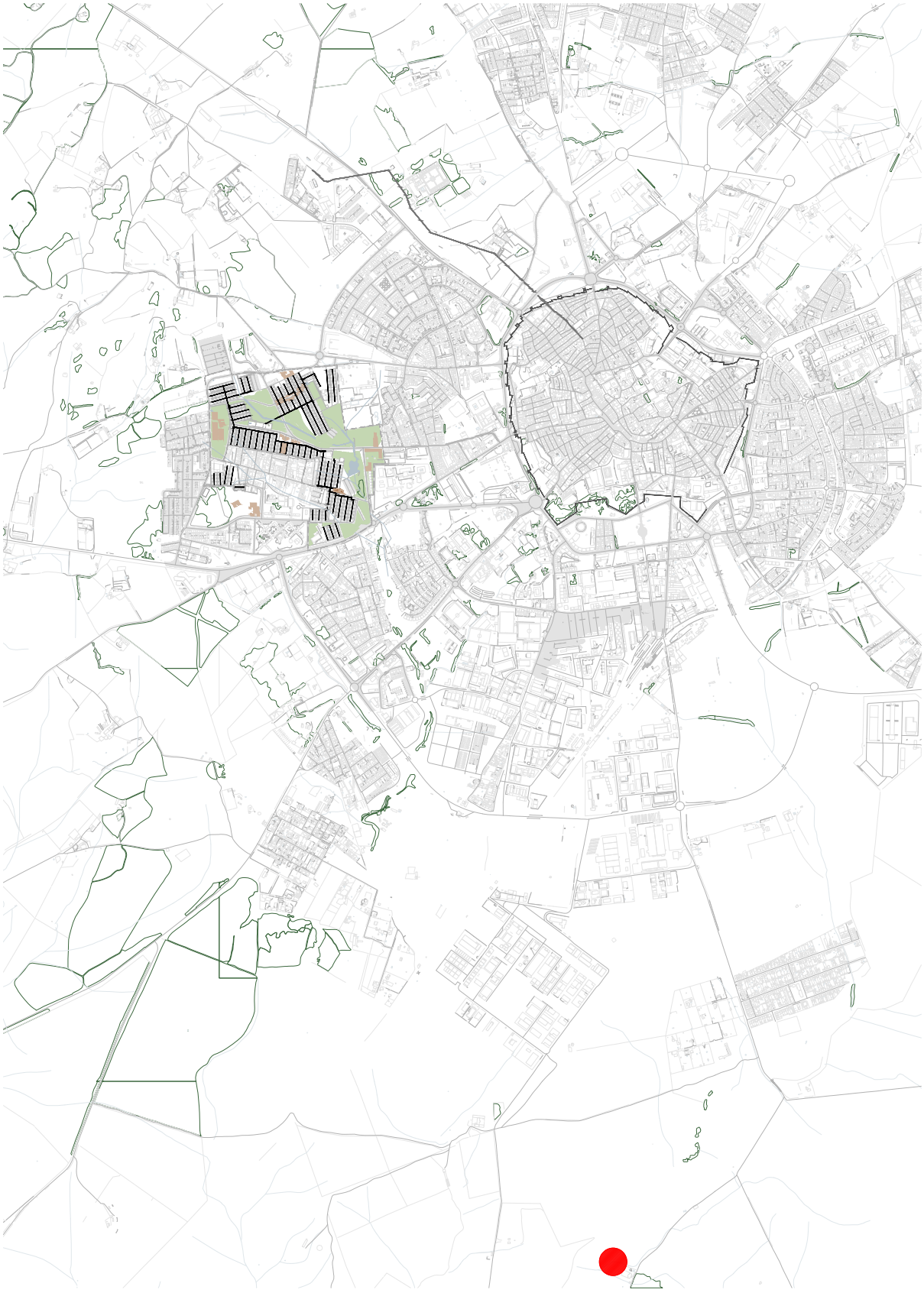

Figure 28. Évora city walls, Aqueduct of Prata, Malagueira, and Évora´s ETAR in red. By author.

Siza´s Plan

In the 1970s, Portugal underwent significant changes. The country was under the dictatorship of the Estado Novo, facing a colonial war in its African colonies and an economic crisis, as well as being isolated internationally. In 1974, the Carnation Revolution *(Revolução dos Cravos)* took place, a military coup that overthrew the regime and led to democratization and decolonization.

In this scenario of transformation, the Malagueira neighborhood project in Évora stood out as an urban innovation, reflecting the need for modern and functional housing solutions in the context of political and social change in Portugal.

The Malagueira project emerged as a response to the housing and urban planning challenges facing Évora after the 1974 Revolution. The historic city of Évora, known for its rich cultural traditions and medieval architecture, also had a pressing need to provide affordable housing and adequate infrastructure for its growing population.

The site's first need was to build the infrastructure for later subdivision. In the case of Malagueira, the sewage system was built from zero, while the remaining technical installations were in the "conduct". **Error! Reference source not found.**

Residents' associations in conjunction with construction companies thus began the first housing blocks in 1977 (Figure 29), while the last blocks were completed almost 20 years later in 1998. The dwellings were divided between cooperatives, private companies, and the state.

The project was characterized by a careful arrangement of residential buildings, public spaces, and community facilities. (planta) Siza also emphasized the importance of preserving the local landscape and culture and spent years working closely with the residents, to update the projects at every rhythm they were building. Figure 31

The project adapted to the undulating terrain and existing construction, as the Santa Maria neighborhood, Santa Maria Squase. Quinta da Malagueira and, Cruz Picada and Senhora doa Gloria Neigborhood. The urban grid proposed for the Project is a continuation and organization of this existing clandestine urban layout. (Figure 27)

Some public spaces in the limits of the neighborhoods were created to make transition spaces, as Praça Santa Maria.

The result is an organic layout of streets and squares, in contrast to the more conventional urban patterns and clandestine neighborhoods that have characterized the city's expansion to date. (Figure 30)

He kept the structure´s height low while giving the distribution order to this new layout of streets. More than adapting also respects the place and leaves clear views of the center. His height restriction helps to maintain a clear view of the center of the city. This was the main difference between the original plan and Siza´s. (Figure 32)

Figure 29. Malagueira construction, on picture are the houses and conduct of this analysis. By CME.

Figure 30. Santa Maria in black and new streets for Malagueira. By CME

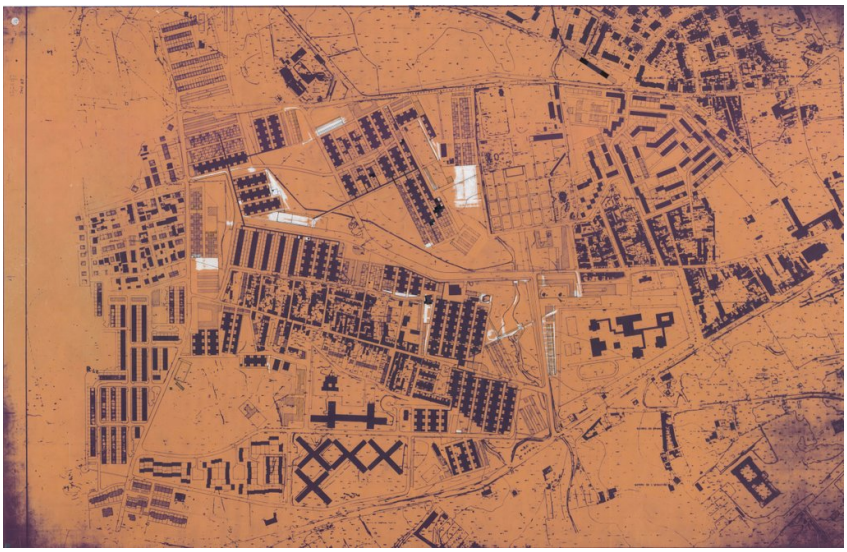

Figure 31. Urban construction in black and main public spaces in white.

Figure 32. City center from Malagueira. By author.

State of Conservation.

Today, the Malagueira neighborhood is widely considered a success in terms of urban planning and contemporary architecture. Its innovative approach has served as an example of how architectural design can meet the needs of the community while maintaining a connection with the local cultural heritage.

However, the maintenance required for the functioning of the neighborhood's services and public spaces has been affected by the lack of financial capital dedicated to the upkeep of the work. As a result, the spaces are not 100% available to residents and the purpose of the spaces has been affected and adapted to a new reality.

Climate change has also directly affected the city, leading to less rain every year besides being unbalanced. This creates problems that could intensify in the future. Making us go in search of new and sustainable ways of getting water, or other.

The structures in Malagueiraa show clear signs of both climate and time-related issues, as well as neglect by humans. Depending on the season, the green areas may appear to be in better or worse condition. It seems that these areas do not receive regular maintenance. Figure 33 Figure 34

Additionally, some of the green areas are being used as urban gardens instead of their intended purpose. This suggests that the original function of these areas has been compromised has been lost. Figure 33.

Some spaces don't achieve their original purpose, like Jardim dos Zocalos square, which was intended to be a space directly related to water. However, nowadays the installation lacks water. Figure 34 Figure 35

The public spaces related to the service conduct are not in the best state, the gardens do not have the best maintenance state, and the conduct structure has visible water infiltration marks and some human damage marks. Figure 36 Figure 37. **Error! Reference source not found.**

In particular, the water system in the area is in bad condition, being one of the priorities to act. Figure 35

Figure 33. Urban clandestine Garden. By author.

Figure 34. Actual state of Jardim dos Socalcos. By author.

Figure 35. Empty water fount. By author.

Figure 36. Garden and conduct state. By author.

Figure 37. Conduct with human marks. By author.

Public spaces.

Malagueira´s plan evolved within an urban reality that is unstable, heterogeneous, and fragmented, characteristics shared by many parts of the current city.

“Meanwhile, 'the plan and the design of public spaces in the Malagueira neighborhood still stand today as a relevant and current example of how one can envision and construct a city, and by extension, its public spaces, in light of the current urban condition” (Coelho R. , 2020)

According to Siza, *'...the relationship between the old city and its expansion constitutes the fundamental and most delicate problem of the Plan...' For this, a '...low-rise expansion needs to be developed, adapting to the gently sloping topography that extends densely and continuously to the city wall and the city's hill'* (Siza A. , Imaginar Evidencia. , 1998)

The city council's proposal also complied with the plan's requirements, but created public spaces without hierarchy, with a series of housing blocks spread across the territory while dividing it and delimiting the road infrastructure.

In contrast to this proposal, the architect Siza designed lower housing blocks strategically located on the topography, related to each other and sequences of public spaces, connected by an aerial infrastructure for the distribution of services, the conduct.

Green Center Space.

The CME's response to the intervention in the neighborhood acknowledges Siza's design principles. Keeping 1/3 of the total area free of construction and creating a green structure centered on the Ribeira de Torregela, a space of "the highest degree of naturalness with a character of continuity and protection of natural elements of the landscape" (Coelho R. , 2020)

The architect started from this central green space around the stream to develop the first issue to be resolved: "the definition of the character of this space and its relationship with the built areas". (Coelho R. , 2020)

It thus defines the focus of the project, the Urban Park and Housing. The need arises to establish a network that allows a transition between the different types of public and private spaces. As well as a hierarchical relationship between the central public space, which is continuous, wooded, and natural, and the built sectors, such as public squares, commercial spaces, and residential streets. (Coelho P. , 2016)

Nowadays, still the most care area in the locality. Houses an important animal life on the region and is part of the natural water system. Figure 38

Figure 38. Animal Life in the green area. By author.

The main public spaces in Malagueira are all interrelated with the conduct structure. This structure works as a system to articulate the neighborhood on different scales. Figure 39 Locates the main public squares in the area. As well as representing the conduct structure in black. With this image, I want to relate the squares with the structure and show how all the conduct´s routes take to these spaces.

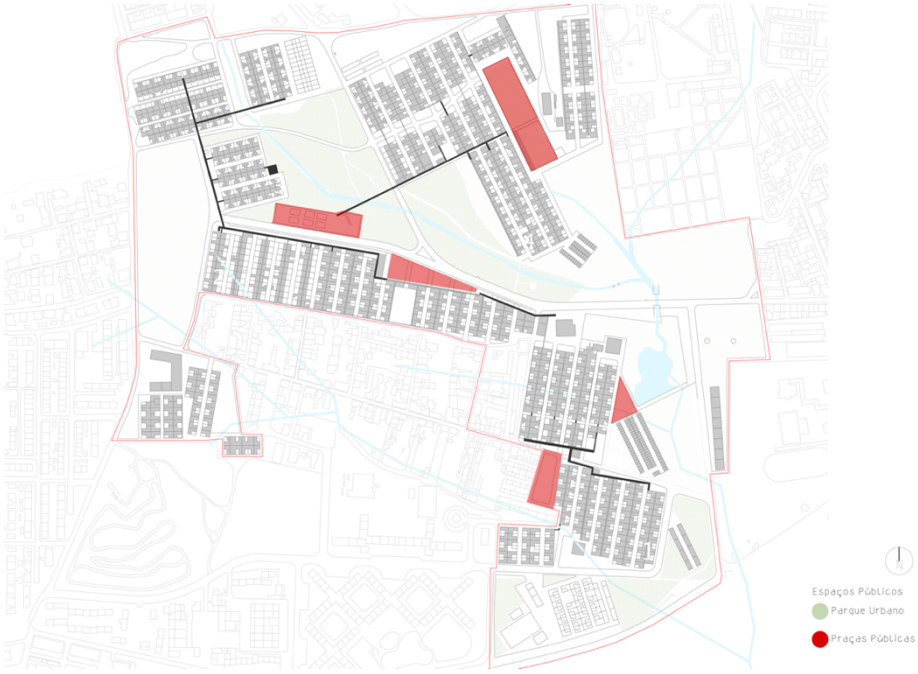

Figure 39. Main Public Spaces in red. By author.

This spatial system establishes the public scale of the neighborhood, complemented by a structuring and articulating element: the conduit. This element consists of an elevated channel that carries the infrastructure of the water, electricity, and communication systems to the housing while creating a pedestrian path along the neighborhood. (Coelho P. , 2016)

Going beyond its technical function, the conduit system thus functions, first and foremost, as a morphological reference system that determines the structure and hierarchy of the Plan, conferring symbolic value, perpetuity, scale, and identity to the system of open spaces, and which makes possible the multiplicity of relationships and scales of uses within the neighborhood." (Coelho R. , 2020) Figure 54

At specific points, this element complements the public space with street furniture and adapts the materiality according to the character of the corresponding space at different stages of its journey. Figure 54

The conduit project was strategically articulated with the public space. The unused spaces drive to the current situation of several urban voids.

We have normal circle pillars (in blue) which are used to cross the street.

In green, there are the open arches that allow the crossing and create the route.

On red we have the closed arches, these don´t allow crossing and create stop moments which are complemented by urban furniture at some points.

Last, we also have the yellow pillars, these are perpendicular walls which create a route and a stop moment at the same time. These are seen near the public squares.

Zones.

For this analysis, the neighborhood was divided into different zones, Figure 40, delimited by housing blocks related to sections of the pipeline. In this way, the "study spaces" are understood as areas where the programs foreseen in the original Malagueira plan are not currently conceived. These spaces qualify as areas that break with the articulation sought by the architect.

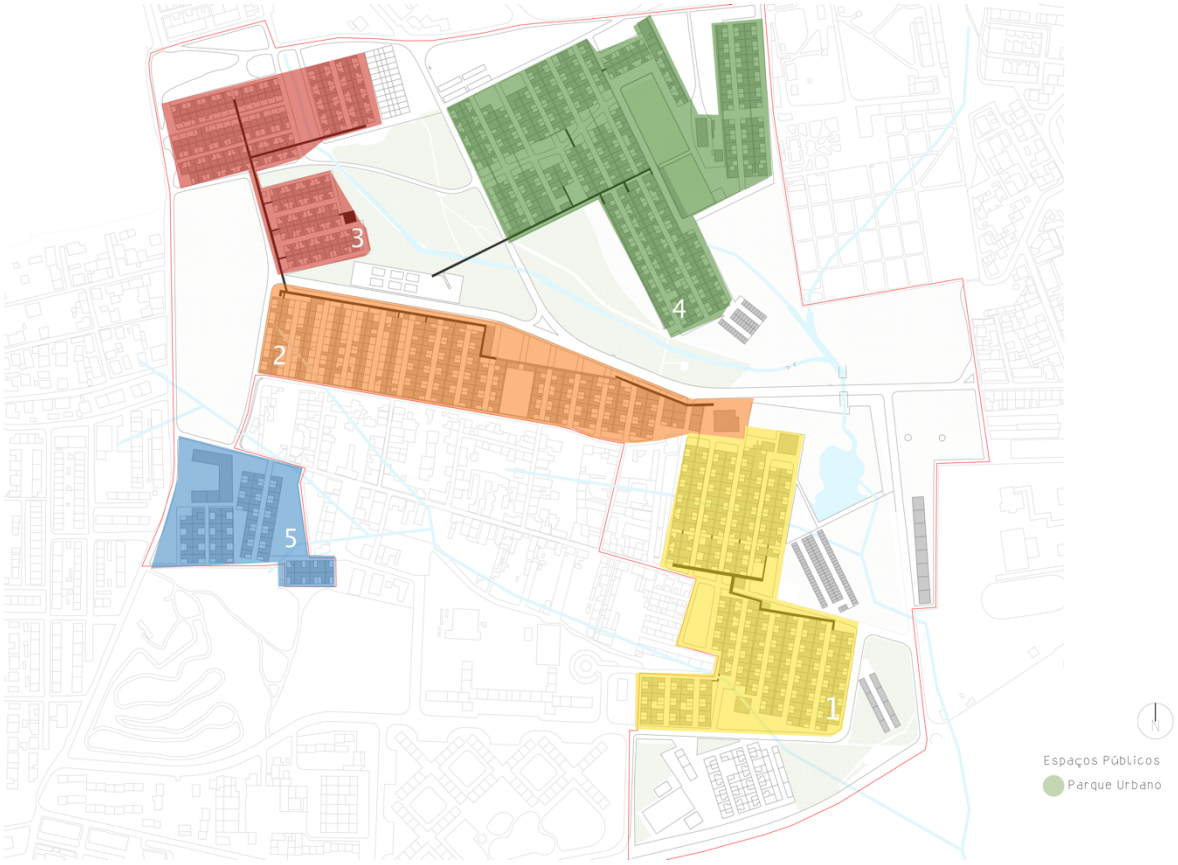

Figure 40. Areas for analysis. By author.

Zone 1 (yellow)Figure 40, is located between the southeast boundary of the neighborhood, to the east of the Santa Maria neighborhood, with a northern boundary on the Malagueira Lagoon Road and to the south with the road to Lisbon. The study area was the subject of urban planning under the Malagueira Plan, which outlined an intervention plan including public square and commercial plots, but only part of the work was carried out.

Zone 2 (orange) **Error! Reference source not found.**, is made up of the housing cells on Avenida da Malagueira. It houses the "central space" of the neighborhood (Praça Zeca Afonso). Here was planned the construction of the Dome, a café, and some public buildings. Creating the central area.

Zone 3 (red) Figure 40, comprises the housing cells located on the northwestern edge of the neighborhood, which create a border with the neighborhood's plateau. This study area is next to the highest green area of the Bairro, which was intended for the construction of the famous tea house and a street with private single-family homes.

Zone 4 (green) Figure 40**Error! Reference source not found.**, are the houses located on the northeastern edge of the neighborhood, bordering Quinta da Malagueira. These blocks are crossed by a commercial street where Broadway 2 was supposed to be built. Broadway was the name of the street. Nowadays the empty spaces are limiting the residential blocks on this street.

The study spaces have in common the fact that they were public interventions designed by the architect in the initial plan for the neighborhood, but which never came to fruition. (red spaces Figure 40). These voids are called Urban Voids for this study.

Urban Voids.

The conduct project was strategically articulated with the public space. Given the current situation of several urban voids. We proceeded to analyze the public space and characterize the pipeline, looking for its relationship.

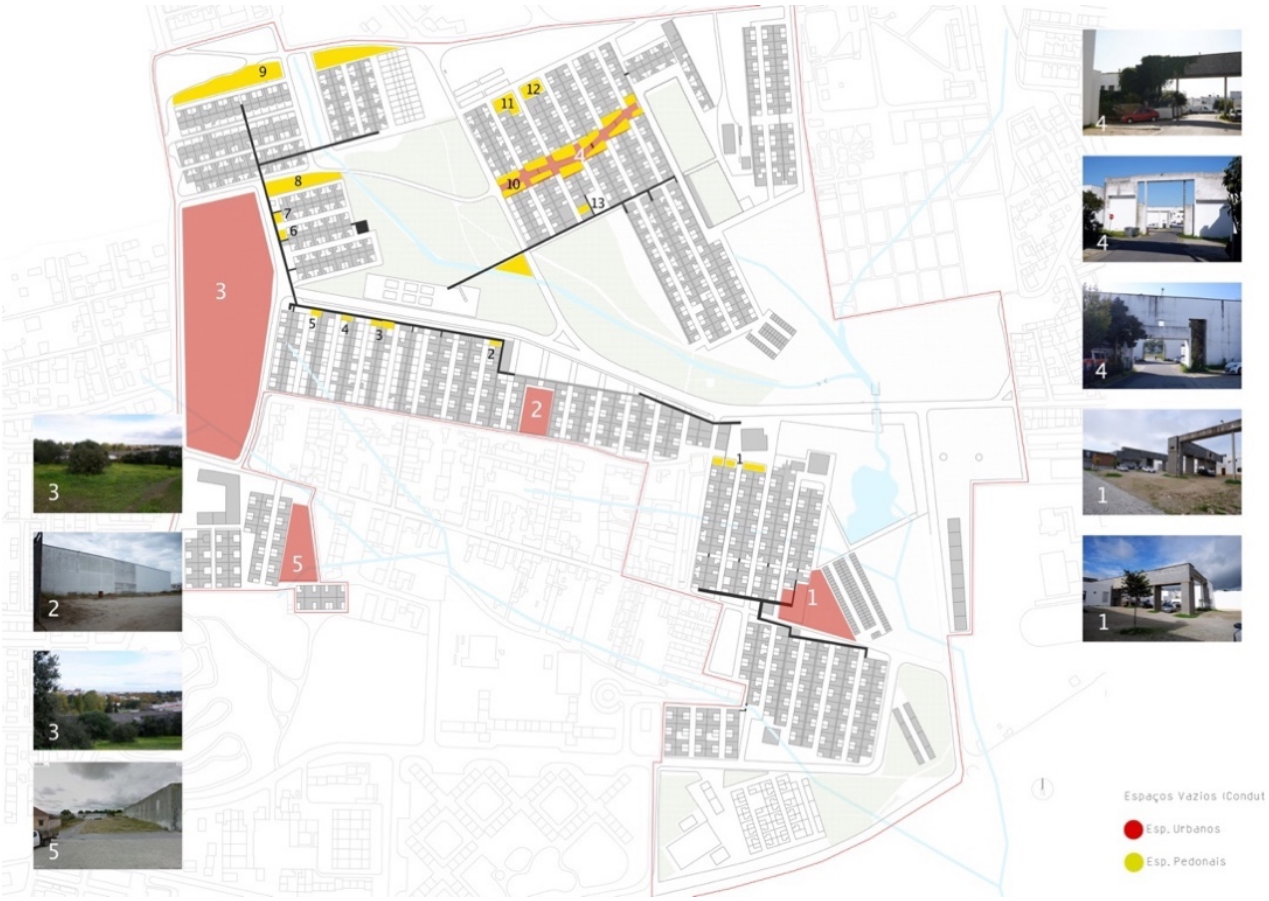

Figure 41. Urban voids in red and street voids in yellow. By author.

However, on a pedestrian scale, there are voids, located on the boundaries between the houses and the conduct, designed by the architect as possible commercial plots or specific programs, but which were never built. (yellow spaces) Figure 41

For this study, two distinct phases were divided: the first phase is the urban analysis, where the *urban voids* and the solutions proposed by the architect are presented.

The second phase deals with cases on a pedestrian scale where the commercial plots have not been built on and their function has been given by the residents.

The two analyses are divided into the zones previously defined for the organization and characterization of these spaces following the route of the pipeline. This route starts from zone 1 to zone 4, and then jumps to zone 5.

- Analysis of urban voids: (red)

Zone 1: The urban void in this zone consists of a plot of land bordered by Sta. Maria Square, Malagueira Lake, and a garage block, which is currently used as a parking lot. This space was originally designed by Siza for commercial premises. Figure 41

Figure 42. Malagueira Lake. By author.

Figure 43. Parking lot in urban void. By author.

The presence of the duct in this space creates a morphology that differs from the rest of the neighborhood, providing crossing moments and stop ones, which would be complemented by the shops. This space is part of the transition route from Santa Maria and Malagueira.

Siza complemented this space with street furniture, located next to the pillars of the conduit, facing Santa Maria square from one size, and facing Malagueira and the garages, on the other side of the conduct.

Zone 2: In the urban void in this zone, the central space of the neighborhood was planned, with the semi-dome and the parish council, consisting of a shopping street that would create a direct entrance from the Santa Maria neighborhood to the neighborhood's urban park (nº2, Figure 41)

However, none of these spaces are currently built. The semi-dome has been approved, while the land earmarked for the parish council has remained undeveloped since construction began. The result is a significant urban void that makes it difficult to connect the Malagueira and Santa Maria neighborhoods.

Zone 3: Corresponds to the highest point of the neighborhood, a plateau with views from the neighborhood to the historic center of the city of Évora. Originally, this area was intended for the construction of the tea house and a block of upper-middle class housing. However, none of the projects were developed and an abandoned green space remained, occupied by gypsy encampments after being evicted from their former homes. (nº3, Figure 41)

Zone 4: Located on the northeastern edge of the neighborhood, the urban voids are unoccupied commercial plots on the main street that runs through the housing block, Broadway 2. These plots were planned as commercial plots, which were delimited by constructive elements of the pipeline, creating variations in each space. However, the commercial plots were never built, with the justification being that the neighborhood didn't need many commercial establishments (no. 4, Figure 41)

Zone 5: The void in this space consists of an abandoned housing block, which consequently led to the abandonment of the public space around it. (nº5, Figure 41)

- Pedestrian voids (yellow) (black numbers)

The pedestrian voids have similar characteristics, they are found on the edges of the housing blocks, in some situations we get them on the edge of the conduct, and in other situations on the outside of the block, in this case, the void goes unnoticed due to the lack of continuation of constructive elements. Figure 41

The first pedestrian gap found on the route (no. 1 in black) is on the boundary between Zone 1 and Zone 2. This gap is occupied as a parking lot, although it is in an area where the pipeline has white plaster, so it was supposed to be an important public space. We notice this is the starting point of the pedestrian route through the conduct, from the main axis E-W linking the historic center.

In zone 2 we found cases of these pedestrian voids in Av. da Malagueira, numbered (2, 3, 4, 5), the cases are between the limits of the conduct and the housing block.

It is possible to assume the voids were left just as free public space, to lighter the relation from the blocks with the conduct.

Zone 3 has several pedestrian voids also numbered in Figure 41, (6, 7, 8) of which 6 and 7 are located between the limits of the pipeline and the houses. Unlike 8, this is a larger gap and lies between two blocks of houses. It is currently dirt and is used as a parking lot.

In zone 4 we have the largest number of pedestrian voids, which are the consequence of the lack of a commercial program on "Broadway" (#10 in black), as well as a series of voids on the outer edges of the blocks identified with #11, #12 and #13 in black, which are currently parking lots for residents. Figure 41

These so-called "pedestrian voids" are spaces that may or may not have had a specific program in Siza's plan. Some of them are spaces left by the architect for use at the "residents' discretion". While others were characterized as commercial plots and social programs.

Summary.

We can conclude that the lack of urban voids plays a fundamental role in the current lack of articulation in the neighborhood. This lack is exacerbated by the pedestrian voids. None of these contribute to the daily life of residents. The functioning of the neighborhood, from a socio-economic point of view, depends greatly on the public spaces available and, even more so, on the function of these spaces.

Understanding the current differences and needs, as well as the principles and design process for building the neighborhood. This work proposes a new functionality for the urban void of zone 1. With a functionality that will bring sustainable development to the neighborhood.

The conduct.

The conduct plays a major role as the infrastructure distribution system: water, electricity, and gas, for the houses and serves more than as a skeleton, as the nervous system of the neighborhood's housing blocks. It is the element that structures the buildings and creates a physical connection between the housing blocks. It was the first piece to be built before the houses.

Function:

It functions as a pedestrian gallery that follows the neighborhood and branches off between the houses to reach the dwellings. The path is created between the boundaries of the houses and the Central Green Space and at times serves as a support for the public spaces and guides the location of the shops. This constructive element creates a physical link between the built blocks and complements the system of hierarchical public spaces up to the private space, and the dwellings (Coelho R. , 2020)

Structure:

Structurally, the conduct walk side form a gallery, made of prefabricated concrete blocks and concrete structure. The blocks are reinforced with metal elements, resting on individual footings Figure 44. This repetition of openings is altered by the different implantations and morphologies of the openings and variations in their position; in their course to point out entrances to shops, delimit building plots or moments along the way. This arch is replaced by a circular column at times when the duct crosses streets and main roads. Figure 46

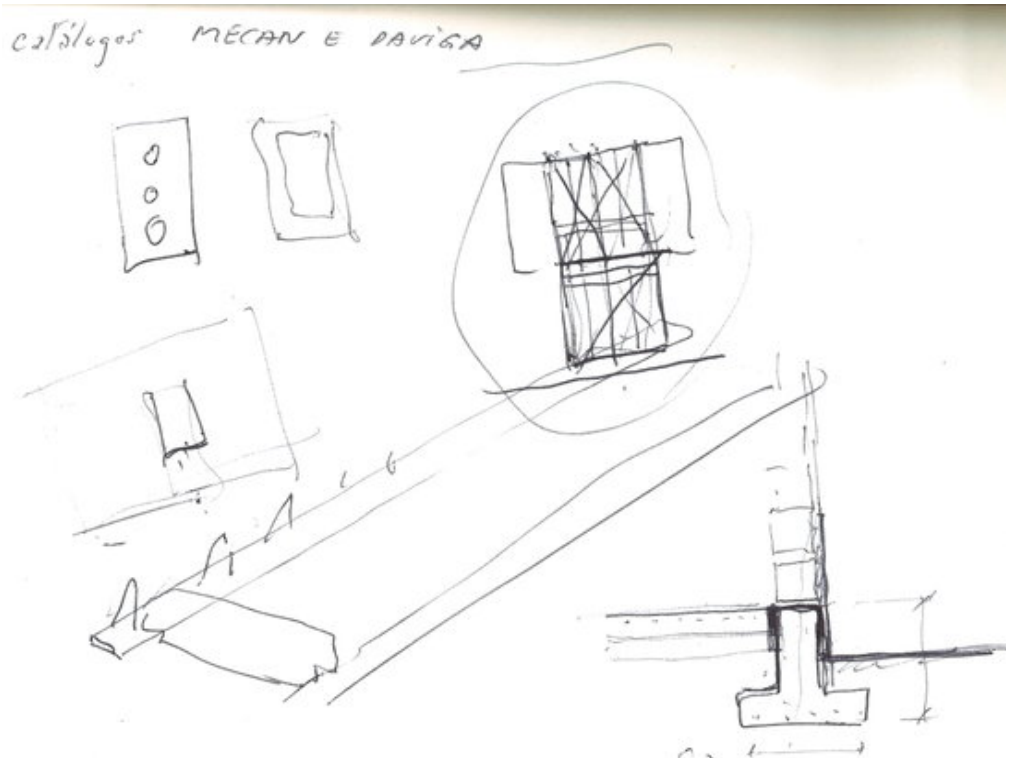

Figure 44. Siza sketch. By drawing matter. Ref: 2512.21

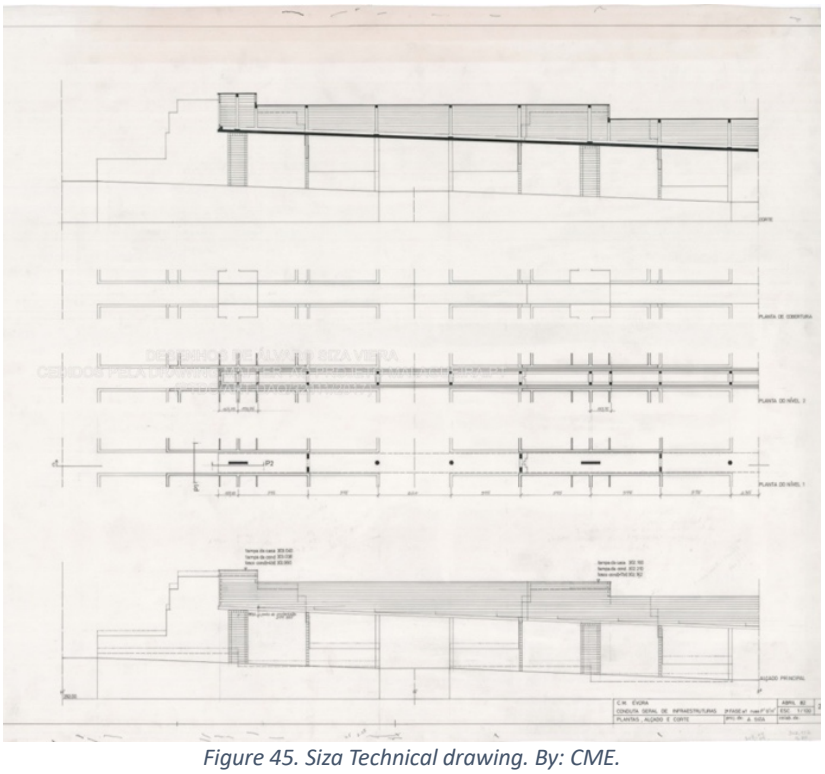

Figure 45. Siza Technical drawing. By: CME.

Figure 46. Entrance Arch, momento. By author.

Distribution:

Interpretating the drawings in Siza's Notebooks (Drawing Matters), it can be concluded that the arcaded gallery supports two prefabricated reinforced concrete beams which in turn receive the slab of the same material, a joint helping to fix the slabs to the beams. This slab creates the support for the infrastructure Figure 44. The ground level is considered in the legend of the drawings to be level 1 and the infrastructure level is level 2.

Level 2 is the space designated for the distribution of services, it is where the water and electricity pass through. Following the Plan's technical drawings, it ended up being a single space. Figure 45

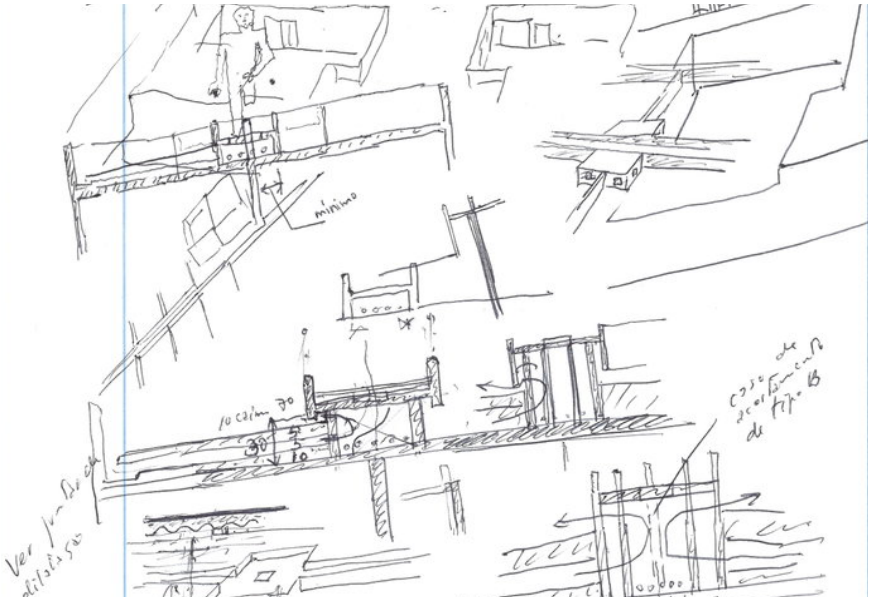

Figure 47. Siza Sketch, possible top route. By drawing matter. Ref: 2512.21

This level is built by another gallery of reinforced concrete arches, closing off the sides with concrete blocks. Except for occasional openings on the sides that allow ventilation inside the structure, these openings vary in basic geometric shapes from street to street, as well as having access doors to the interior at cut-off points.

Figure 48. Conduct Openings. By author.

The roof level, considered level 3, following Siza's sketches, we realize that the original idea was for the gallery to have a third recurve level where a continuous path would connect the neighborhood from an upper level to offer unique views of the neighborhood and the historic center throughout the journey (Rodrigo Lino Gaspar) Figure 47. This idea didn't come to fruition because it had no sun protection and was an exposed gallery with limited accessibility.

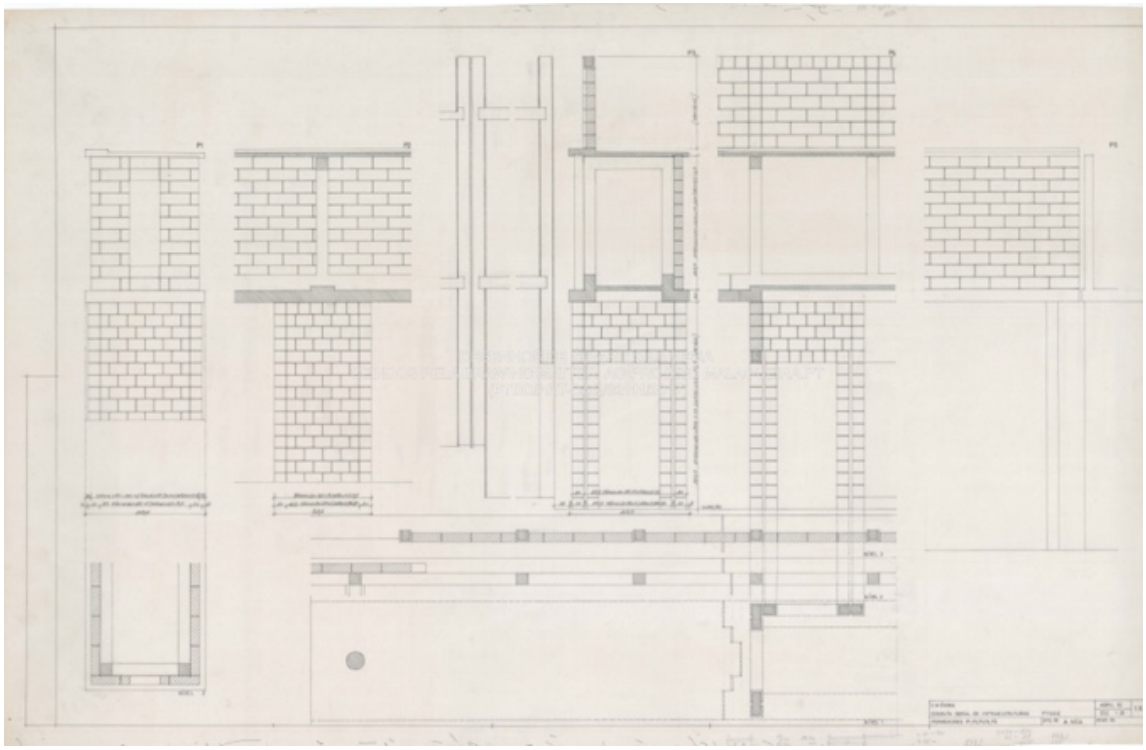

Figure 49. Siza Technical drawings. By CME.

The concrete block material. Figure 46 was chosen to make a clear contrast with the white plaster of the houses and the orange brick of the public spaces. As Rodrigo Lino Gaspar mentioned, concrete is also referred to as "contemporary stone", due to its popularity as a building material at the time. This material was also chosen to save money and justify its construction in the Plan.

But this structure adapts its materiality when it needs to mark out important public spaces. This is the case in Zeca Afonso Square when it acquires a materiality equal to that of the houses, to house the central public space where the controversial Malagueira Dome was to be located. In the north of the neighborhood, in the area known as Broadway 2, this materiality of the conduit is repeated.

On the Zeca Afonso square route, the structure of the duct is no longer a gallery of arches but continues with concrete walls that create an enclosed passageway Figure 50, to have a "living" character and serve as support for the shops located there, so the duct in this part of the route acquires a second function. The structure of the duct on this route is also the external walls of the commercial space located in the square. We can therefore conclude that it articulates and creates the commercial space.

Figure 50. Zeca Afonso Square. By author.

In the case of Broadway 2, the duct takes on the materiality of plaster where it delimits the spaces of the commercial plots designed for this street. Because these spaces are not currently built, the commercial lots are currently parking lots for residents, which are protected by the structure of the duct.

A range of equipment for maintaining the conduct is located along the route. The electricity services are in brick volumes that are easily located along the route (fig. 50).

Figure 51. electrical instalations. By author.

This structure has different moments in its insertion into the blocks and dwellings, at which point it gives rich variations to the route with different supports for the upper-level structure. These exceptions adjust the route and create a certain rhythm for pedestrians. (fig. 40)

Figure 52. Arch route. By author.

Gallery Circulation.

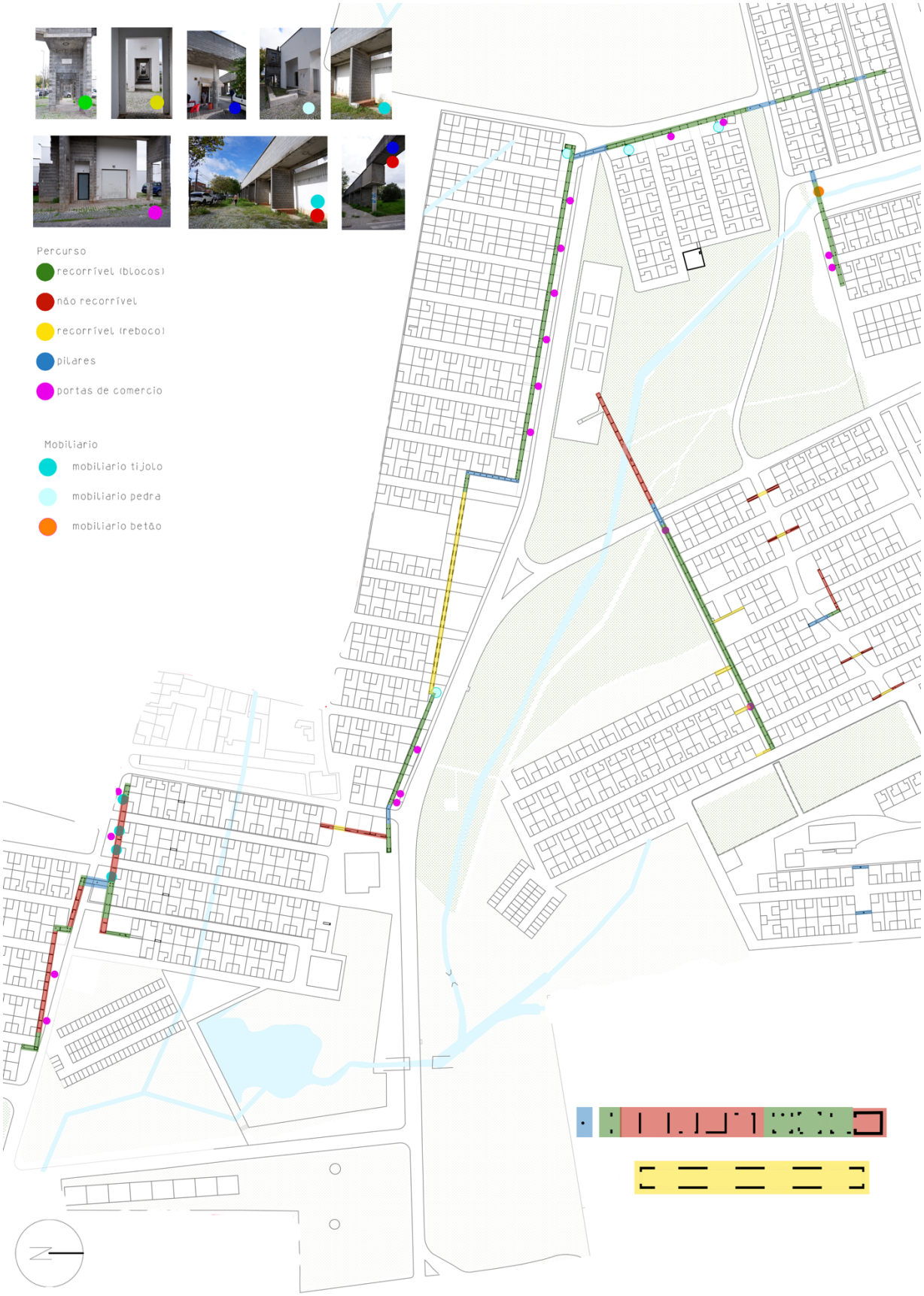

Figure 53. Conduct gallery circulation. By author.

We have normal circle pillars (in blue) which are used to cross the street.

In green, there are the open arches that allow the crossing and create the route.

On red we have the closed arches, these don´t allow crossing and create stop moments which are complemented by urban furniture at some points.

Last, we also have the yellow pillars, these are perpendicular walls which create a route and a stop moment at the same time. These are seen near the public squares.

The public spaces limited by the structure are complemented by street furniture designed on the gallery supports; in these cases, the arches are replaced by walls to create separation in the spaces. The moment of change in materiality in Praça Zeca Afonso (fig. 52) is used to create a space for street furniture as well. In this space rich in materiality, the two materialities of the Conduct, concrete, and plaster, coexist with the Natural Stone that is used for the design of street furniture in the neighborhood.

The conduit's street furniture also has different materials: if part of the route is made of concrete, the furniture is made of brick (fig. 51) and if part of the conduit is made of plaster, it is made of stone (fig. 52).

Figure 54. Urban furniture. By author.

The detail of connecting the different types of spaces with a structure that "distributes the essentials of life" to the residents is a poetic and intelligent technique that Siza used to make Malagueira stand out in yet another respect.

Figure 55. Urban Furniture and materiality change. By author.

Figure 56. Water infiltration. By author.

The actual situation of this structure is not the best due to water infiltration problems and some adaptations residences has done.

Summary:

This element has a very complex importance for the Malagueira project, it is still an element of much controversy today, but its necessity for the construction of the housing blocks is indisputable. In contrast to its conceptual complexity, the structure has an admirable simplicity of construction and materiality. Still, its presence sets the Malagueira neighborhood apart from any other collective housing project.

His construction, with a brutalist style, was treated in a delicate way. To create an organization in the space and give support to the residents. Its presence makes unique áreas to improve people quality.

Due to the conceptual importance of this structure, a deep analysis was needed to understand the different intentions of the architect projecting it.

The research is also necessary in case of a possible intervention in it´s structure and a possible completion of it.

Water in Malagueira.

Existing conditions.

Figure 57. Malagueira Lake. By author.

A current problem in the city of Évora and Malagueira is the lack of water. The Alentejo region is characterized by a dry climate, and the current environmental problems make the situation even worse. The need has arisen to look for new sustainable technologies to solve this problem, such as water treatment. In this case, systems that work with natural and organic elements passively.

The actual sewage system in Évora directs all the sewage water to the main treatment plan that exists in the city. The Évora ETAR, as how is called, treats almost 80‰ of the water of the county (CME, 2021). Here the process is of the activated sludge type. Other ETAR in the area also use Stabilization Ponds and Septic tanks.

The water is brought to the main ETAR Figure 28 by the network of outfalls, which run along the main watercourses, Ribeira da Turgela (vivida., s.d.)on the west and Rio Xamarra (CME, 2021) on the east. These outfalls receive the sewage water from the general collector network, which covers the entire urban area.

At the entrances of these outfall systems exist storm drains, whose function is to redirect the rainwater to the main watercourses in the case of heavier rains.

Figure 58. Water courses entering to Malagueira Lake. By author.

Figure 59.. Water courses entering to Malagueira Lake. By author.

The main ETAR was projected to receive sewage water from 80.000 people approximately which means a daily water flow of almost 14.000m3[2]. After the treatment an important part of this water is taken back to the hydric medium, giving them back to the watercourses.

The remaining treated water is passed by one more disinfection process and is used in the ETAR installation as second-use water for the green spaces and even in the chemical process of the plan.

Concluding this analysis, I can say the actual situation of Evora´s water system is:

- 80% of the water in Evora is treated in the same ETAR.
- This place uses a mix of organic and chemical processes to clean the water.
- After the process most of the water goes back to the hydric medium, not having a reutilizing process.

These conditions made me understand that there is little effort nowadays to reuse the water after the process, at least in the area. In this situation, it should be interesting to find a way where the water could be treated separately from the main system to reuse it for some specific goals, as it could be for the green spaces of other neighborhoods in the city.

There are currently many technologies available for sustainably treating wastewater and rainwater, and there are current regulations on the use of these techniques. In addition to the advantage that they are not harmful to health and allow for the reuse of the intervention space.

[2] https://issuu.com/epal.lisboa/doc (Machado, 2007)s/folheto_etar_evora_2021

Natural Water Treatment System

The actual situation needs a different point of view of solutions and a more sustainable one to contain a long-term problem which could be a lack of water. To change the actual solution this research focuses on natural treatment systems.

These natural methods are the oldest used by humans, which combined with different technologies is possible to create an effective system. This research is focused on integrated wetland technology systems.

Integrated Wetland Technology (IWT)

IWT. Integrated Wetland Treatment (IWT) is a wetland treatment system in which water is treated partly by wet soil and plant roots. This allows the treatment plant to be inserted into an urban area where users are not harmed, but rather benefit from the creation of new spaces. (Stefanakis K. T., 2011)

Wet filtration is the main process in this system, but it must be accompanied by different stages to achieve the desired levels.

The use of these ecosystems is not considered a new technological development. Since the first human civilizations, wetlands have played an important role in economic terms and as vital sources of life.

"Wetlands provided raw materials for simple up to more complicated constructions and discoveries. For example, dried reeds were used to build houses, papyrus was used to make paper or even construct ships. Not only for humans but also for nature and wildlife, wetlands represent a source of life and contribute to a better quality of life." (Stefanakis K. T., 2011)

This natural system is currently seen as "a great ecological significance, which provides habitats for numerous species and supports their life." (Machado, 2007). The capabilities and benefits of these habitats have been exploited by humans.

"They also act as filters, retaining the pollutants from the water that flows through on its way to lakes, streams, and oceans. Thus, their significant natural productivity is harnessed and put to different uses by man-made systems." (Stefanakis K. T., 2011)

In the past, this knowledge was not discussed, but eventually, its ability to purify water was recognized and proven. The study of wetlands and their positive capacities eventually led to research into the potential of artificial wetlands as water pollution reducers.

Despite this relatively old knowledge, it is only in the last 30 years that there has been a significant increase in interest in water treatment systems based on this natural technology. (Machado, 2007)

Conventional Treatment vs Sustainable, pros and cons.

Compared to conventional water treatment systems, the integrated wetland system contributes to sustainable development and brings many benefits to the place where the plant is implemented.

Conventional technology has certain negative points that make it difficult to design and build in urban centers or rural communities.

- *They require "extensive sewage collection networks for their operation, which is related to complex environmental and economic concerns.*
- *These plants have a low aesthetic quality because they require large mechanical parts such as pumps, dosing systems, and fans.*
- *Their construction requires extensive use of concrete and steel, and their operation produces noise pollution and reduces air quality by producing odors.*
- *The system requires a lot of energy to operate, which means high greenhouse gas emissions.*
- *High investment, operating, and maintenance costs are involved.*

On the other hand, wetland treatment plants are considered an efficient treatment: ***(pros)***

- *Equal or lower investment and reduce operating and maintenance costs by up to 90% compared to traditional systems.*
- *This water system does not require chemicals for treatment in contrast to traditional systems.*
- *Energy levels are very low, mainly used in the operation of pumps, which can be avoided by designing a gravitational flow at certain stages of the process.*
- *The system does not require the presence of a professional to operate; it only needs to be serviced periodically and has a useful life of over 30 years.*
- *Water treatment in wetlands has virtually no by-products. The sludge can accumulate to a total volume of 1-3% of the total volume of the plant. Even so, it is necessary to remove the sludge periodically once or twice a year.*
- *It can be applied to different scales of installations.*

(Stefanakis T. , 2018)

The cost of removing the sludge represents almost "*50% of the total maintenance costs."* (Machado d. S., 2017) Another by-product of the process is plant biomass. "*This is collected once a year and can be used as a biofuel or to produce compost.".* (Stefanakis T. , 2018)

"It has a flexible design" that allows it to be built almost anywhere. *"It is a very competitive system for private homes or residential complexes especially in rural, remote, island, and mountainous regions."* (Stefanakis K. T., 2011)

Its capabilities work perfectly for small villages up to small/medium-scale cities. It is also a viable alternative for the industrial area and very attractive for its economic and environmental benefits.

The system also has certain limitations: **(cons)**

- The greater need for space compared to a conventional system (different studies and innovations made in the area have improved techniques for this problem (e.g., the use of vertical flow systems).
- Continuously the area demands for wetland plants are greater and more expensive than the area for conventional ones.
- A need for a delicate design process because an error can cause problems with odors or water leaking up through.

(Machado, 2007)

Conclusions

For more than a century, water treatment has been carried out using centralized, conventional plants. In general, low-income regions cannot afford to build such large and complex systems.

Alternative techniques are therefore required in developed or developing regions, which should combine acceptable performance, cost efficiency, and sustainability to cover local needs. These characteristics adapt to the profile of what Evora and specifically the Malagueira needs.

The characteristics of non-centralized treatment in wetlands fit these parameters satisfactorily. In addition, the idea of using plants to clean water influences innovation,

These reasons support exploring the capacity of an Integrated Wetland Technology (IWT) water treatment plant.

Types of Artificial Wetlands for water treatment

To choose the most efficient Wetland System for my purpose an analysis and comparison of the types have been made between the most used worldwide.

This classification is based on the water flow path of the system and the type of vegetation used and are:

- Free Water Surface Constructed Wetlands (FWS).
- Horizontal Subsurface Flow Constructed Wetlands (HSF).
- Vertical Flow Constructed Wetlands. (VF).
- Sludge Treatment Wetlands (STW).

(Stefanakis T. , 2018)

Free Water Surface Constructed Wetlands (FWS CWs)

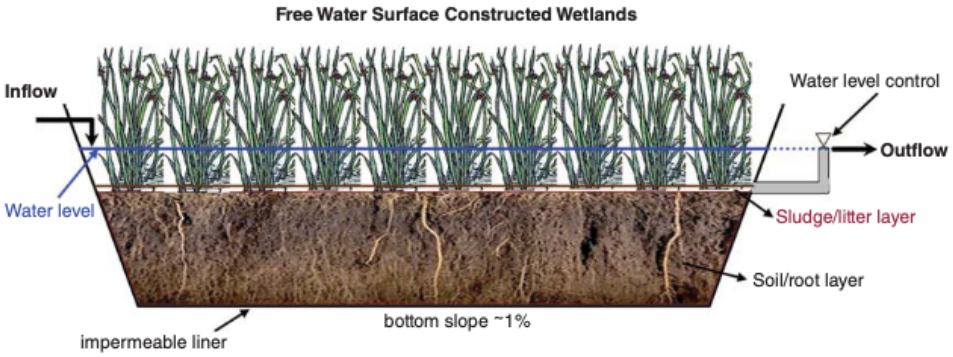

Figure 60. Fws CSs Section. By. ITT Bombay.

The basin contains a 30 to 40-cm thick layer of soil in which the macrophytes are planted.

The water surface is *10-50 cm above* the soil layer and is thus exposed to the atmosphere and solar radiation.

Suitable vegetation for this type is common reeds (Phragmites australis), cattails (Typha spp.), rushes (Scarps), and grasses (Juncus).

The water flows horizontally through the stems and rhizomes of the plants and meets the top layer of the plant and the associated biofilm, which allows the pollutants to be removed through various physical and biological processes.

The performance of this type of wetland is good for the removal of suspended solids (SS) and biochemical oxygen demand (BOD) and satisfactory removal of nitrogen (N) and pathogens, but phosphorus (P) removal is generally limited. (Machado, 2007)

It has been applied for the treatment of primary and secondary municipal effluents, but mainly for the polishing of treated effluents, stormwater, and road runoff, as well as for agricultural effluents. Is also used to treat produced water, i.e., water containing petroleum hydrocarbons. (Industrial Uses) (Stefanakis K. T., 2011)

This type of CW can attract mosquitoes if the water remains stagnant inside the system due to inadequate construction and they have larger area demands compared to the others.

Horizontal Subsurface Flow Constructed Wetlands (HSF CWs)

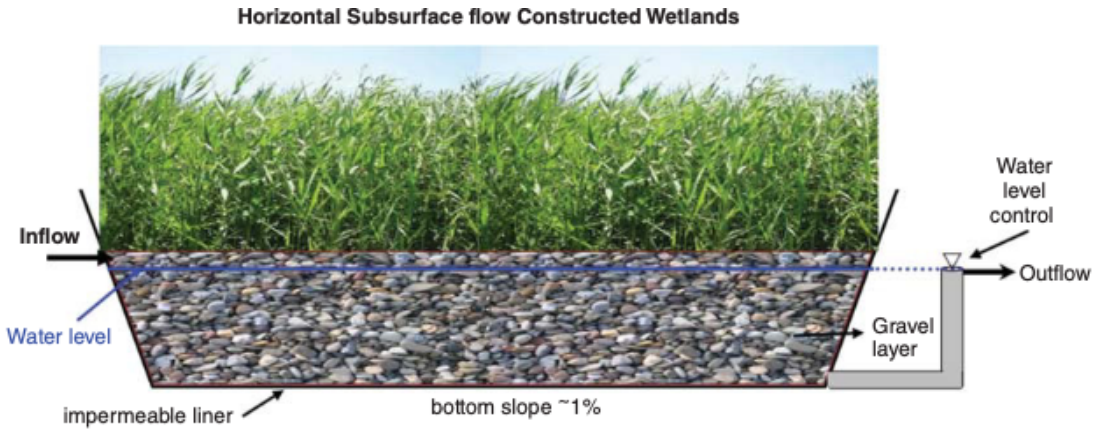

Figure 61. HSF CWs Section. By: ITT Bombay.

They are basins containing gravel material planted with common reeds (Phragmites australis) or other wetland plant species such as Typha and Scarps.

The substrate used is rock and gravel of different origins and compositions. The thickness of the substrate layer varies from 30 to 100 cm.

There is no water surface exposed to the atmosphere, and the water level is kept 5-10 cm below the surface of the gravel.

The water flows horizontally through the pores of the substrate and meets the grains of the medium, the plant roots, and the attached biofilm. (Stefanakis K. T., 2011)

This type of CW has proven to be very effective in the treatment of municipal wastewater, removing SS and organic matter (BOD) at high rates, although the removal of nutrients (nitrogen, phosphorus) is generally lower. (Machado, 2007)

Thus, the respective health risks due to possible human contact with wastewater and mosquito problems are limited.

Are used to treat a wide range of industrial wastewater, for example, mine drainage, dairy products, pigs, olive oil mills, landfill leachate, cork effluent, contaminated groundwater, hydrocarbons, etc.

Are more widely used in Europe than in the USA.

Have the advantage of lower area demands, although capital costs may be higher.

Vertical Flow Constructed Wetlands (VFCWs)

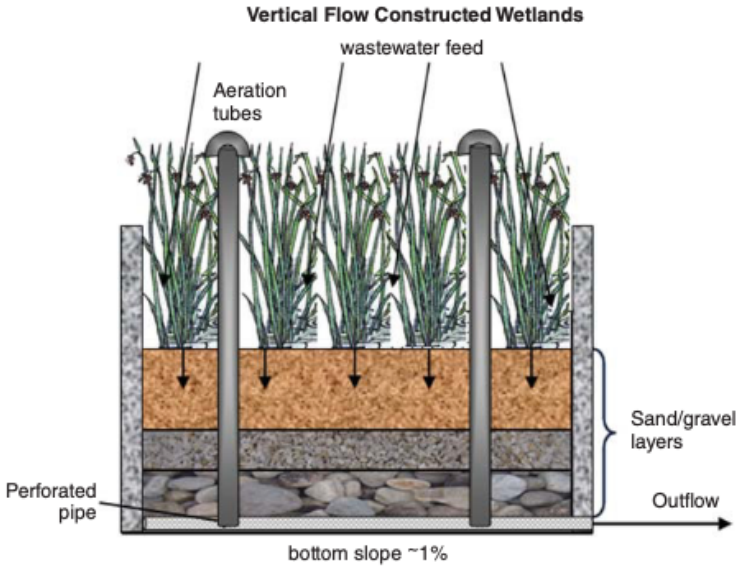

Figure 62. VFCWs Section. By: ITT Bombay.

The most common configuration is a basin containing several layers of gravel and sand with increasing gradation from top to bottom. The total thickness of the substrate varies from 30 to 180 cm. Normally, the top layer of the bed is a layer of sand. The plants are established on the gravel surface or the sand layer. (Stefanakis T. , 2018)

Common reeds (Phragmites australis) and cattails (Typha latifolia) are the two most widely used plant species.

They contain perforated vertical aeration tubes, which are connected at the bottom of the bed to the drainage collection pipe system. These aeration tubes allow better aeration of the deeper parts of the bed. Because of this, these systems have a higher oxygen transfer capacity compared to the other types.

The most widely used mode is intermittent loading; wastewater is applied evenly over the entire surface of the bed in batches and drained vertically by gravity.

Due to better aeration capacity, they are very effective at removing organic matter (BOD) and ammonia nitrogen. Phosphorus removal remains limited. (Machado, 2007)

They have lower surface area demands compared to Horizontal and Free Water systems.

Their overall effectiveness has allowed this type of CW to be used for the treatment of wastewater from different sources, for example domestic, municipal, industrial, agro-industrial, and landfill leachate.

Compared to other systems, the construction investment is higher. Mainly used in Europe.

Sludge Treatment Wetlands (STWs)

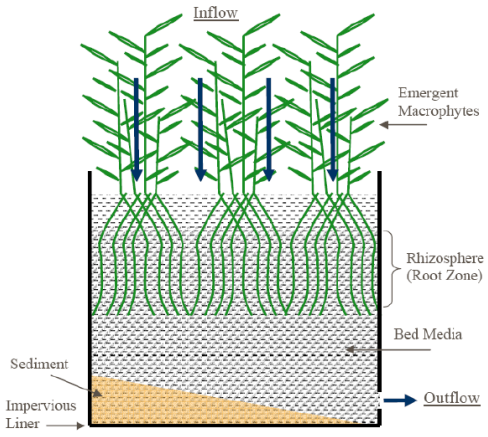

Figure 63. Sludge Treatment Wertlands (STWs). By: ITT Bombay.

They appear as alternative systems to mechanical dewatering methods. They are practically constructed wetlands with vertical flow modified for dewatering and drying wastewater sludge.

These systems represent a special application of CW technology for the dewatering and managing excess sludge produced in conventional wastewater treatment plants.

STWs can be rectangular or trapezoidal excavated basins filled with gravel and planted with reeds.

Usually, the basin contains 1-2 layers of gravel and a layer of sand on top. The total thickness of the porous media layers varies between 30-70 cm.

Sludge is applied to the top of the bed in feeding cycles: a typical feeding scheme is 2 to 10 days of sludge feeding followed by 1 to 3 weeks of rest or even longer.

The bottom layer also contains a network of perforated plastic pipes to collect the drainage water that flows vertically through the body of the bed.

This network of lower tubes is connected to the atmosphere by vertical perforated plastic aeration tubes, which extend above the top layer of the substrate.

At the top of the bed, organic solids gradually accumulate. With alternating feeding/rest periods, the accumulated solids are dehydrated and, in the long term, converted into stabilized material.

After a few years of operation, the residual sludge layer is removed and reused as valuable biosolids, for example in agriculture as fertilizer.

(Stefanakis T. , 2018)

Vegetation for the systems:

1. 

Figure 64. Phragmites australis. By: OCAP.

2. 

Figure 65. Cattails, by: OCAP.

3. 

Figure 66. Rushes, by: OCAP.

4. 

Figure 67. Grasses, by: OCAP

Conclusion:

The construction conditions of these systems are like each other, although the difference in their working process and water flows, gives them important pros and cons that are likely to be taken into consideration for the final decision.

In terms of productivity, all the systems work properly:

"The performance of this type of wetland is good for the removal of suspended solids (SS) and biochemical oxygen demand (BOD) and satisfactory removal of nitrogen (N) and pathogens, but phosphorus (P) removal is generally limited." (Free Water Surface Constructed Wetlands) FWS

*"This type of CW has proven to be very effective in the treatment of municipal wastewater, "…removing SS and organic matter (BOD) at high rates, although the removal of nutrients (nitrogen, phosphorus) is generally lower." (*Horizontal Subsurface Flow Constructed Wetlands) HSF

"Due to better aeration capacity, they are very effective at removing organic matter (BOD) and ammonia nitrogen. Phosphorus removal remains limited." (Vertical Flow Constructed Wetlands) VF

"They appear as alternative systems to mechanical dewatering methods. They are practically constructed wetlands with vertical flow modified for dewatering and drying wastewater sludge." (Sludge Treatment Wetlands) STW

The *FWS*, *VF*, and *STW* show better effectiveness at removing organic matter (BOD) and nutrients like Nitrogen (N) and pathogens. Although the *HSF* removal of nutrients like these is generally lower.

They have a limited capacity for the removal of Phosphorus (P), which is an essential nutrient for plants and animals, "*however excessive phosphorous in surface water can cause explosive growth of aquatic plants and algae. This can lead to a variety of water-quality problems, including low dissolved oxygen concentrations*." (OCAP, 2019)

These technologies can be used for the same objective:

"It has been applied for the treatment of primary and secondary municipal effluents, but mainly for the polishing of treated effluents, stormwater, and road runoff, as well as for agricultural effluents. Is also used to treat produced water, i.e., water containing petroleum hydrocarbons" (Industrial and Domestic Uses, FWS)

"This type of CW has proven to be very effective in the treatment of municipal wastewater" … "Are used to treat a wide range of industrial wastewater, for example, mine drainage, dairy products, pigs, olive oil mills, landfill leachate, cork effluent, contaminated groundwater, hydrocarbons, etc." (industrial and domestic uses, HSF)

"Their overall effectiveness has allowed this type of CW to be used for the treatment of wastewater from different sources, for example domestic, municipal, industrial, agro-industrial, and landfill leachate." (VF)

This comparison shows the efficient working process that can have the Vertical Flow Constructed Wetland Plants in comparison with the rest. Regardless, all of them have shown the process to be effective.

The risk of having a treatment water near a residential area is also taken in consideration:

In the case of the Free Water Surface Constructed Wetlands, they made a bad point here due to*: "This type of CW can attract mosquitoes if the water remains stagnant inside the system due to inadequate construction and…".*

The HSF system corrects some of this: *…" There is no water surface exposed to the atmosphere, and the water level is kept 5-10 cm below the surface of the gravel. Thus, the respective health risks due to possible human contact with wastewater and mosquito problems are limited."*

This problem is also treated in the VF*: "They contain perforated vertical aeration tubes, which are connected at the bottom of the bed to the drainage collection pipe system. These aeration tubes allow better aeration of the deeper parts of the bed"* …, this mechanic never drops the water in direct contact because it flows vertically.

The last comparison point in this analysis is the area needed for its operation, where the FSW goes with a negative point as *… "they have larger area demands compared to the others…".*

The HSF already better this point*: "Have the advantage of lower area demands, although capital costs may be higher".*

The best escalation we can have once again is the VF with: *"They have lower surface area demands compared to Horizontal and Free Water systems.*" But *"compared to other systems, the construction investment is higher."*

It is important to consider that these systems already will have a higher investment rate than an average plan, thus this technology maintenance is lower than could be any other

water treatment plan. And the working life is longer. Because of this, the financial rate is the last to take in denomination in this analysis.

As we can relate to an area like Malagueira, which is mainly a domestic and residential area with important public spaces, the best-adapted system would be the **Vertical Flow Constructed Wetland.**

This system has the best features in the analyzed categories: Their uses are aligned with the residential and domestic ones. It is the safest for humans and it is the one that needs less space to be more productive.

Design Considerations of Constructed Wetlands

The construction of CWs is a complex process that requires a specialized team. Proper installation is essential for the system to function optimally. Currently, there are still no unanimously accepted guidelines or widely applied methodology.

System design tends to differ not only from country to country but also between designers and specialists/engineers. However, there are some general rules and some basic design considerations used in the process, especially for simple applications, e.g. domestic wastewater, including meteorological, topographical, and operational parameters, such as: (García, 2010)

- Climatic conditions of the area where the system will be installed.

The Alentejan region is characterized by a dry climate, and the current environmental problems make the situation even worse. The area normally has bigger dry periods and heavier ones, where the conditions always are in the limits. Most of the rainwater falls during a few days per year. Which makes it extremely dense rains or dry.

- Topographical information to choose the most suitable installation site and ensure gravity flow (if possible).

This system will be installed in the lowest point of Malagueira, where is expected to collect the water from sewage system of the neighborhood and some surrounded areas too. This location makes possible to ensure gravity flow to enter int the plan and also during the process.

- Geological structure of the area to guarantee the stability of the hillocks.

The geological area surrounded is the hills of the neighborhood. These hills conduct the water flow by gravity up to the treatment plan.

- Availability of the necessary land.

The land for this plant is going to be a space of the Bairro, which was supposed to serve as a commercial area. In this analysis is numbered as the 1º empty urban space.

- Legal permits required.

In the project is expected to use the original Siza´s implantation project, this structure will help to organize the tanks and even use water reservoir. This would help to match the neighborhood´s esthetic style but also legally to be constructed in the area.

-Any nearby ecologically sensitive areas or wildlife habitats.

One of the most important water courses of the region passes near the plan. This water creates the actual Malagueira Lake and creates an ecological walkway that goes through all area. This watercourse also receives (García, 2010)the rainy water flow in the dense days.

- Current and future wastewater flow and volumes.

The current wastewater flow and volumes that this area receives is *Q* = the average daily flow rate (m^3/d); 100m3, this is the equivalent of 100.000 lts. daily. Approximately 1/3 of the total of Malagueira wastewater.

- Appropriate or desired reuse of treated effluent.

The treated effluent is expected to be reused in the public spaces of the area as well as second-use water for domestic use.

(García, 2010)

Wetland Capacity Calculation.

There are three main design parameters for constructed wetland systems that are usually considered: unit area demand (m2/he); organic and hydraulic loading; and oxygen transfer capacity. (Burkitt, 2003)

Generally, designing and sizing a wetland bed ranges from a simple "rule of thumb" to more complex models. There are simple equations for surface area calculations for the removal of substrates such as BOD5, NH4+-N, TP, and TN contaminants. An equation for calculating the surface area required to remove BOD5 is as follows:

$$A = \frac{Q[\ln(C_O/C_e)]}{K_T\, dn}$$

Where:

- A = the surface area of the bed (m^2)
- d = the saturated depth of the bed (m)
- n = the substrate porosity (decimal fraction)
- K_T =the first-order areal rate constant(m/d)
- Q = the average daily flow rate (m^3/d)
- C_O = the mean influent concentration (mg/L)
- C_e = the required effluent concentration (mg/L)

This rule of thumb is a good indicator to calculate the proximally size of the bed, using the chemical data of the water: mean and required concentration, and the porosity of the substrate as factors. (Burkitt, 2003)

The daily flow rate, depth of the bed, and the order areal rate constant are the other factors of the equation. With this data, we can have an approximate of the area needed to reach the desired results.

The Q value was calculated using daily water consumption data per person from the 2021 census. Counting a group of 700 people, equivalent to the number of residents in block number 1 of the neighborhood.

Évora is the city with the highest per capita consumption in the domestic sector (175 Lts, pp) (PORDATA, 2021). As the average household size in Évora is 2.4 people, 3 people per household were considered. This gives a total of 100,500 Lts per day.

The equivalent of 100m3 of water flowing into the sewage system per day.

The value of K is the constant coefficient of area removal. An average temperature of 20º was considered.

Substituting the current data into the given formula we have:

- A =? (m2)
- D = 1,5 (m)
- n = 0,25-0,50
- K_T = 0,49 (m/d)
- Q = 100 (m^3/d)
- C_O = 7996 (mg/L)
- C_e = 19 (mg/L):

$$A = \frac{Q[\ln(C_O/C_e)]}{K_T\, dn} = \frac{100[\ln(7996/19)]}{0{,}49(1{,}5)0{,}25} = 3288{,}3 \text{ m2} = 3300 \text{ m2}$$

3300m2 is the minimum area needed of wetland to make the system effective.

The IWT is the second phase of the treatment plan. This needs to be complemented with others processes to create the system and reach the results. The other phases needed are described next.

Creation of a IWT treatment water plan.

The system works in different phases, which are divided into preliminary, primary, secondary, and third treatment.

The different stages are a proven system currently marketed by different companies in Europe and the rest of the world. The system designed in this work uses the system developed by (Enviro, s.d.)

This system was developed in different tanks, every one of them with different objectives and internal processes that creates a circuit from preliminary, to 1º, 2º, and 3º phases.

Phase 1: Preliminary treatment:

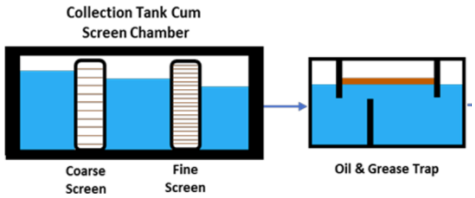

Figure 68. preliminary phase diagram. By: ITT Bombay.

This first phase is the reception of water and preparation for the first tank entering.

- The system is connected to the existing sewage structure. In the project case, the connection is made exactly in the interception of Rua Principal de Santa Maria and Rua António Aleixo in the lowest area of the sewage of the neighborhood.

- The water reaches the first collection tank, passing by different screen chambers, these are the first cleaning of the largest object that the tank cannot process and could be a risk for the system.

- After the chambers, it passes through a grease and oil collector.

(Enviro, s.d.)

Figure 69. Chambers and oil collectorl. by: ITT Bombay.

Phase 2: Primary Solid Removal Tank.

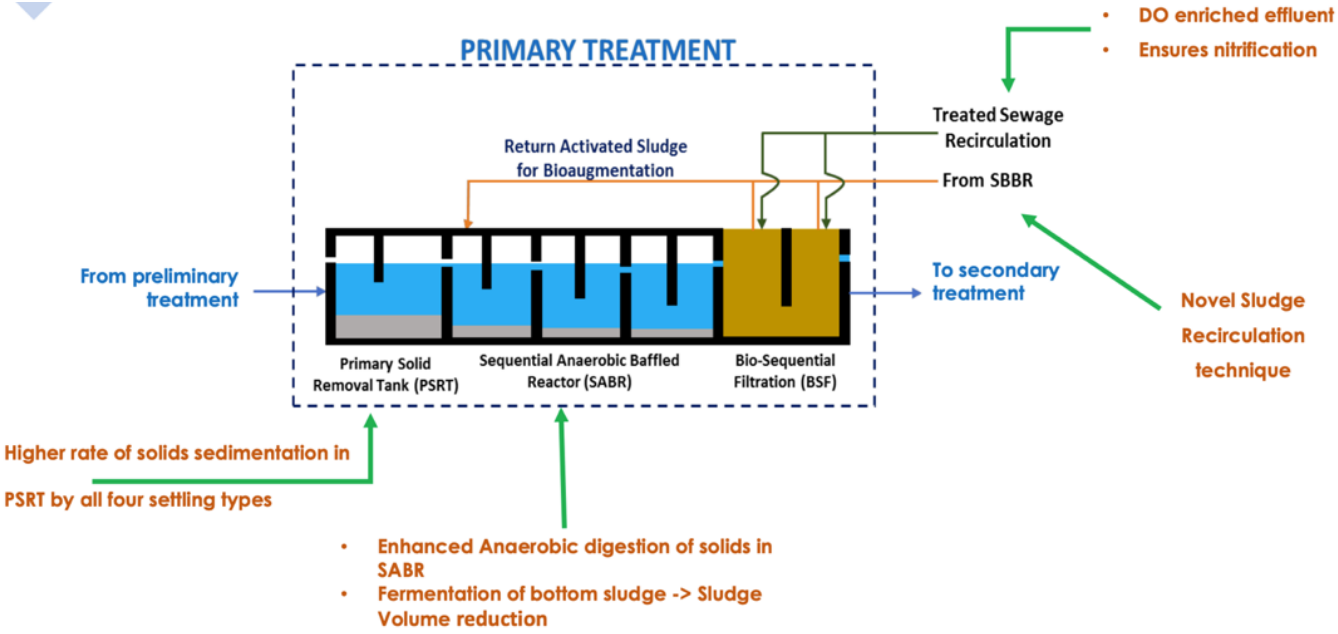

Figure 70. Sediment Tank process. by: ITT Bombay

- This phase receives the water from the preliminary treatment, to go into the primary solids' removal tank. This part of the process has the highest rate of solids sedimentation.
- From the primary goes to the sequential anaerobic baffle reactor, here are enhanced the anaerobic digestion of solids. The sludge volume reduction is the result of the fermentation of the bottom sludge.

- The last part is a bio-sequential filtration made by the treated sewage recirculation, with the novel sludge recirculation. To ensure nitrification and do enriched effluent.

- All this system is named as PSRT which means "primary solids removal tank. Which functions as a primary treatment removes 60-70% of suspended solid along with 35 – 40% of BOD.
- This tank needs to have access to the interior to make the sludge removal periodically and the odors duct to reuse the area as exterior space.

(Enviro, s.d.)

Figure 71. The surface of PSRT with access doors and odors ducts. by: ITT Bombay.

Phase 3: StaticBed Biofilm Reactor

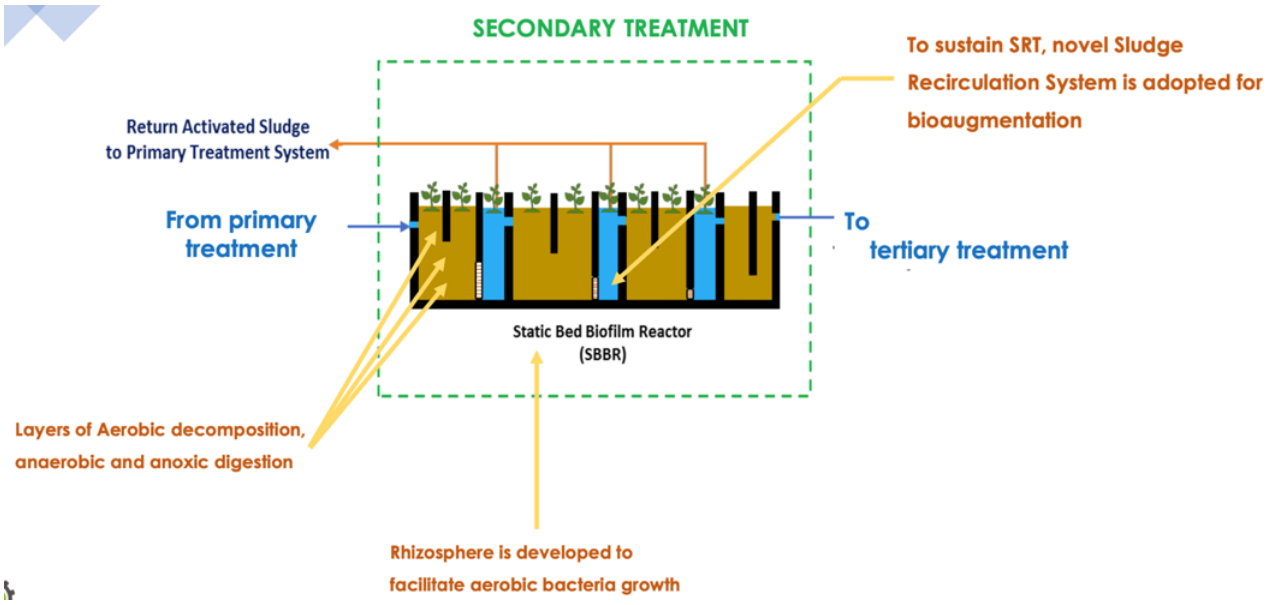

Figure 72. Planted bed reactor. by: ITT Bombay.

- Static bed biofilm reactor is a constructed wetland with vertical flow with the function for dewatering and drying wastewater sludge. This planted bed behaves as a secondary treatment and reduces 80-90% of BOD.

-The two-stage sludge management system lengthens the frequency of sludge removal from planted beds and provides an additional edge to IWT against most of the wetland-based technologies.

- They contain perforated vertical aeration tubes, which are connected at the bottom of the bed to the drainage collection pipe system. They allow better aeration of the deeper parts of the bed. These systems have a higher oxygen transfer capacity compared to the other types.[3]

Figure 73. Planted static bed. by: ITT Bombay.

(Enviro, s.d.)

Phase 4: Filtration Process.

-Pressure Sand Filter.
- Activated Carbon Filter. (ACF)
- Disinfection Unit. (Ozone or UV treatment or hypochlorite dosing):
-Treated Water Collection Tank.

This tertiary treatment unit removes remaining suspended solids and reduces microbial contamination.

Final treated water is collected in the treaded water collection tank before being sent to the hydrophilic medium or reincorporated in the water system as second-use water.

Figure 74. Disinfection process. By ITT Bombay.

Figure 75 Final Water. by ITT Bombay.

(Enviro, s.d.)
Summary:

This is a green treatment water solution system that already exists, these systems are natural processes that when together create a reactive solution to clean the water up to levels of second-use permissions.

The process is divided into three phases which can be individual structures with the capacity of adapting the water system. It is a natural process created to be inside urban areas, so there is a low risk for residents. Is a relatively small size but could bring a big impact in major quantity.

Many companies around the world offer similar processes. It is possible to create this plan in any European country nowadays.

Learning about natural processes combined with architecture can be a new way of finding solutions that the actual global world can bring to us.

This research guided my interest to design, as a Final Architectural Project of my master thesis, a Water Treatment Plan following the adaptation necessary for an IWT system.

The calculation made was to design a plan with a capacity for 100 m3/d of sewage water, this number is equal to the amount of sewage water produced daily for the residents in the first habitational block of Malagueira (figure 35) and Santa Maria neighborhood (figure 64).

Project.

The project is going to be a natural treatment water plan. This plan design is composed of three tanks that were calculated and explained in the previous chapter. These tanks are going to be part of a complex of new installations for public spaces.

My proposal is based on the principles and standards and the integrity of the Malagueira neighborhood as an architectural work as well as current needs and the search for sustainable and innovative solutions that can be applied to other projects.

Location.

Located in the first empty urban space (figure 36). Next to Praça Santa Maria and near the Lake. The intervention area is limited by the Santa Maria main street at the south, the garages at the northeast, and the conduct infrastructures and existing buildings at the west and north.

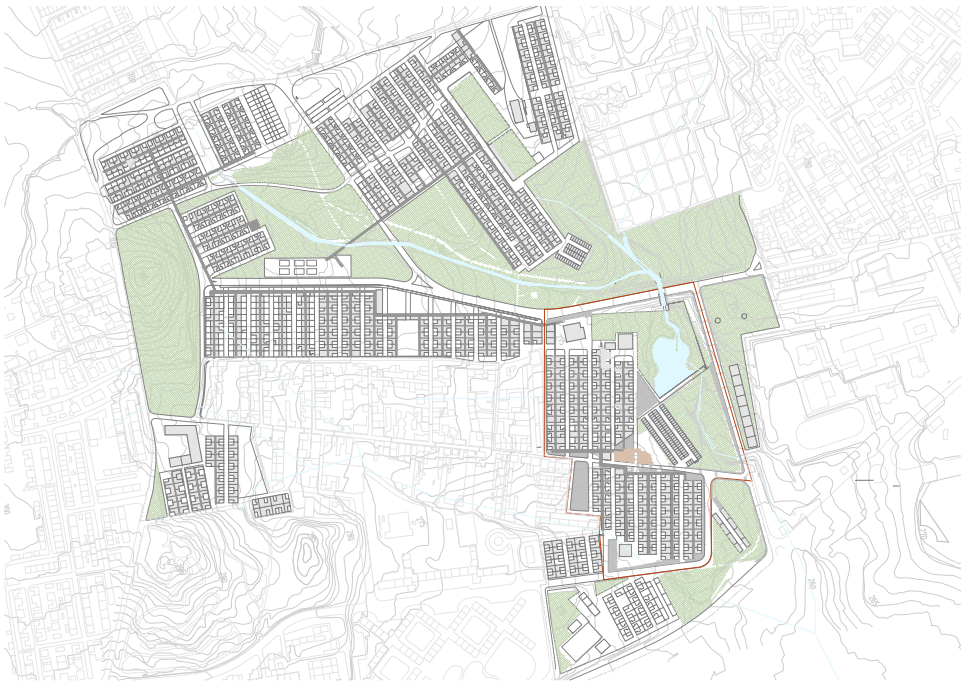

Figure 76. Malagueira´s plan with the intervention area in red and the project in brown. By: author.

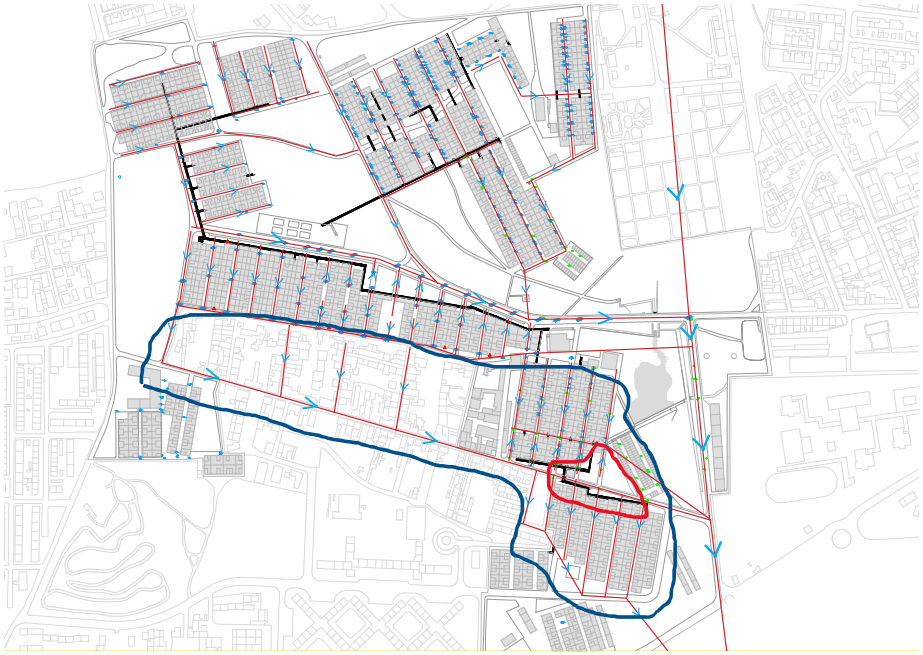

Figure 77. Malagueira´s plan with the intervention area in red and the project in brown. By: author.

This location makes the area the public space at the lowest level of the neighborhood. Tending to receive a good amount of drain water from the upper levels.

Intervention Dimensions.

The complex has total a of 2260m2 of constructed area plus 1000m2 of green areas. The total area is divided into exterior space (700m2) and buildings (714m2). The constructed wetland has a build area of 576m2. Plus, the water tanks of 240m2 the first one and the last 18m2.

Siza´s design.

The plan adapted its form to the Siza´s implantation project that was designed for this area. However, its function was denominated as a commercial space. The new function helps to create an attractive way of benefiting the residents.

Following Siza´s ground area for the complex, Figure 78, there is a game relation between the building complex and the conduct infrastructure.

An axonometric design of the complex allows the interpretation of the south view of the buildings and helps to read the height limits and openings. Figure 79

I identified the first volume was divided into different spaces, one of them already selected as the butcher, the rest without any specific purpose.

The second volume in the plan, the curved one, was specifically pointed out as the organic market for the area. The two buildings are connected by the last part of the conduct which was never built.

In my research, I found technical drawings of the organic market, respectively the side views, section, and general plans, Figure 80. As well as the foundation, Figure 81, and structure plan, Figure 82. Was also found the interior Figure 83, and roof plan, Figure 84. Also, some detailed sections and side views were available. Figure 85

I didn't find detailed drawings for the other commercial building. As a result, I did an interpretation of the organic market building and structure system, with this exercise I was able to create a similar solution for the new coworking building.

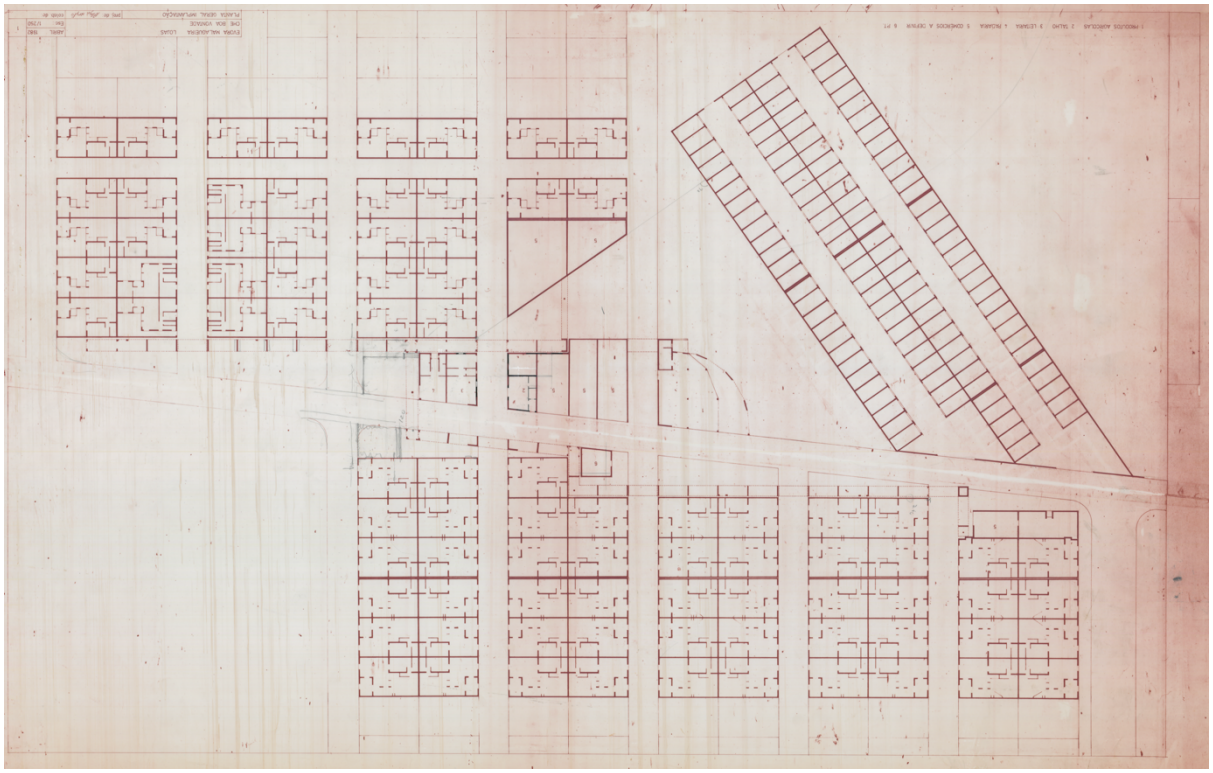

Figure 78. Siza technical drawing of the ground level of the area. By CME.

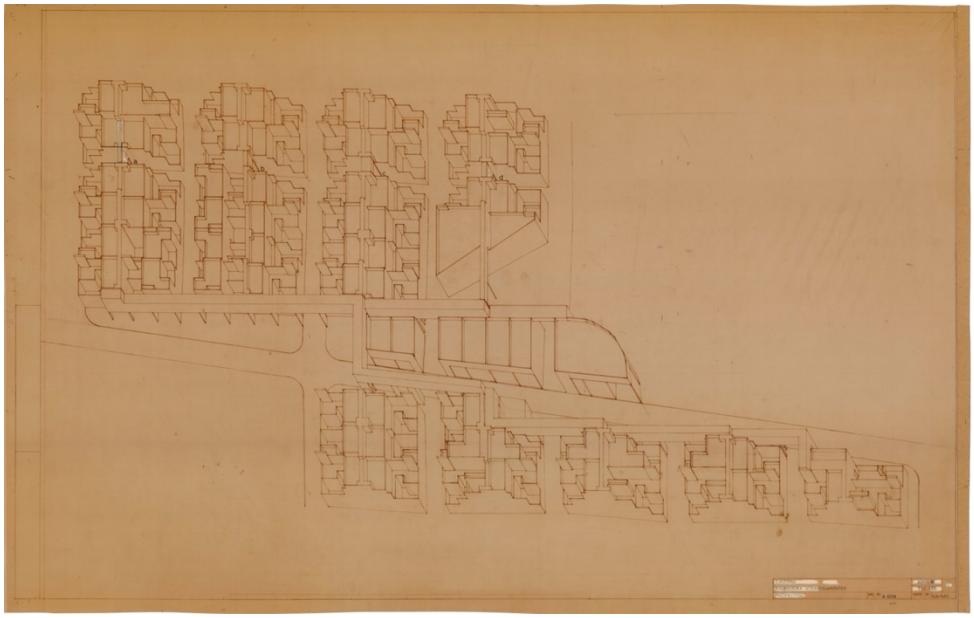

Figure 79. Axonometric drawing of the complex, by: CME.

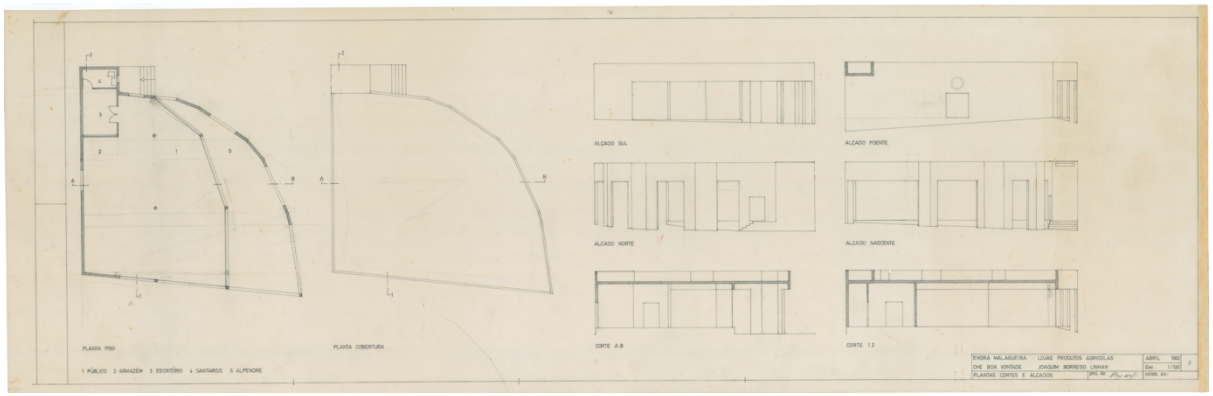

Figure 80. Organic market technical drawings. Side views and sections. Drawing Matter.

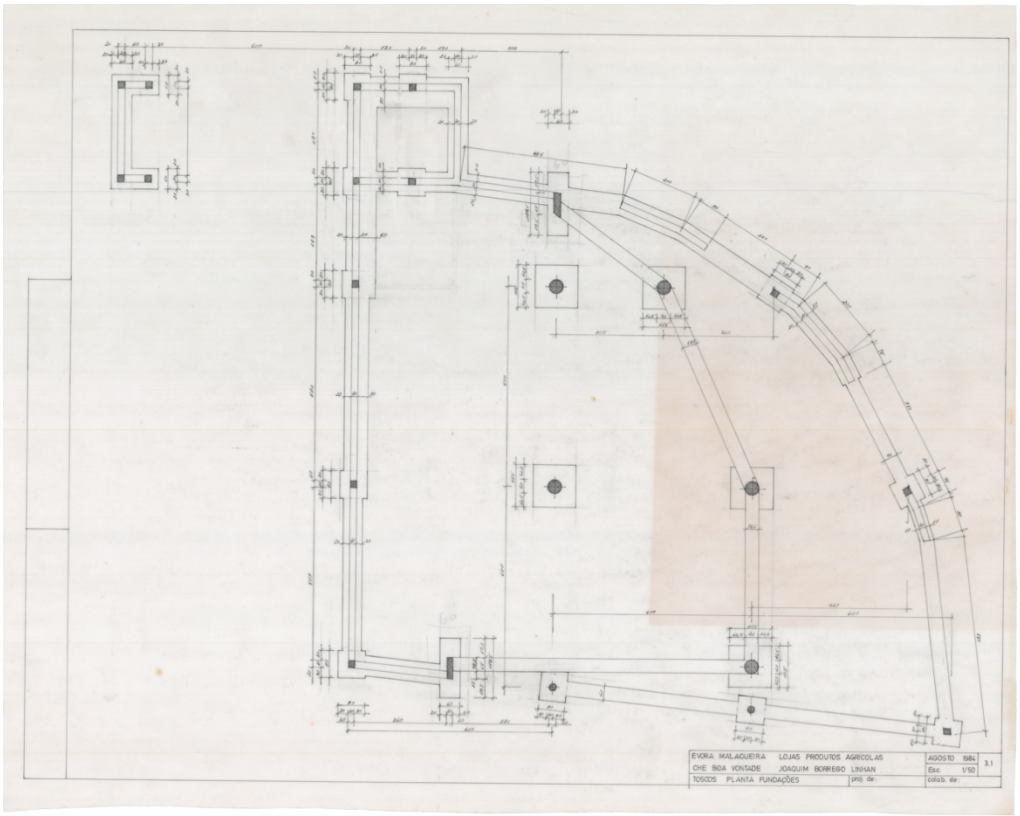

Figure 81. Foundation plan, organic market. By: Drawing Matter.

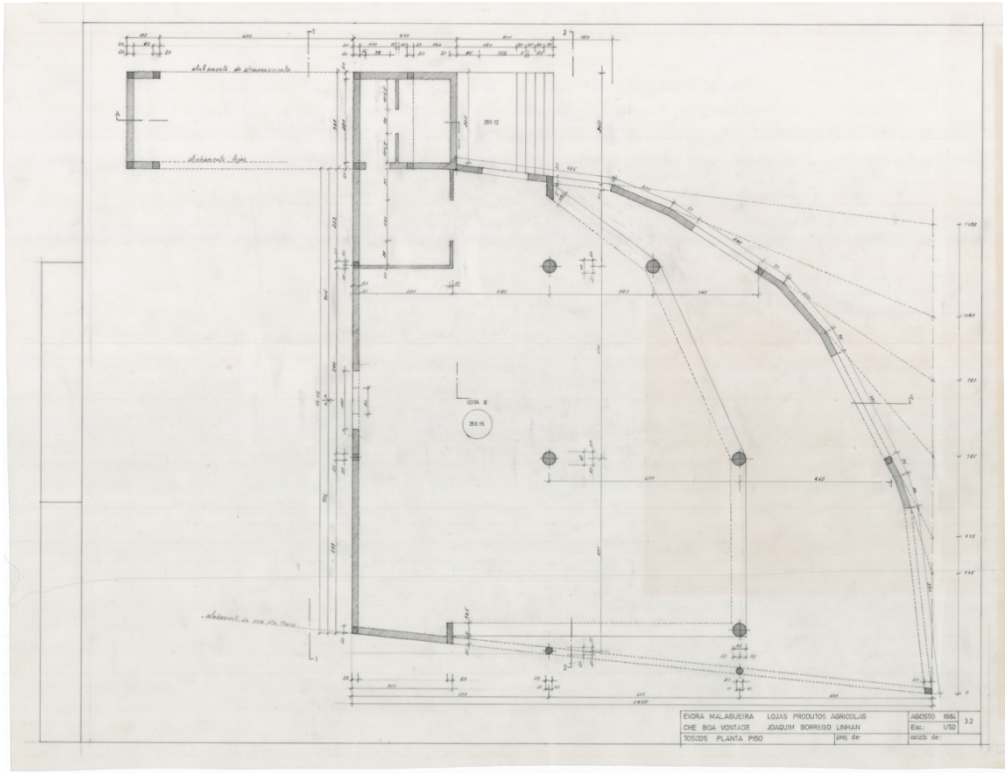

Figure 82. Structure plan, organic market. By: Drawing Matter.

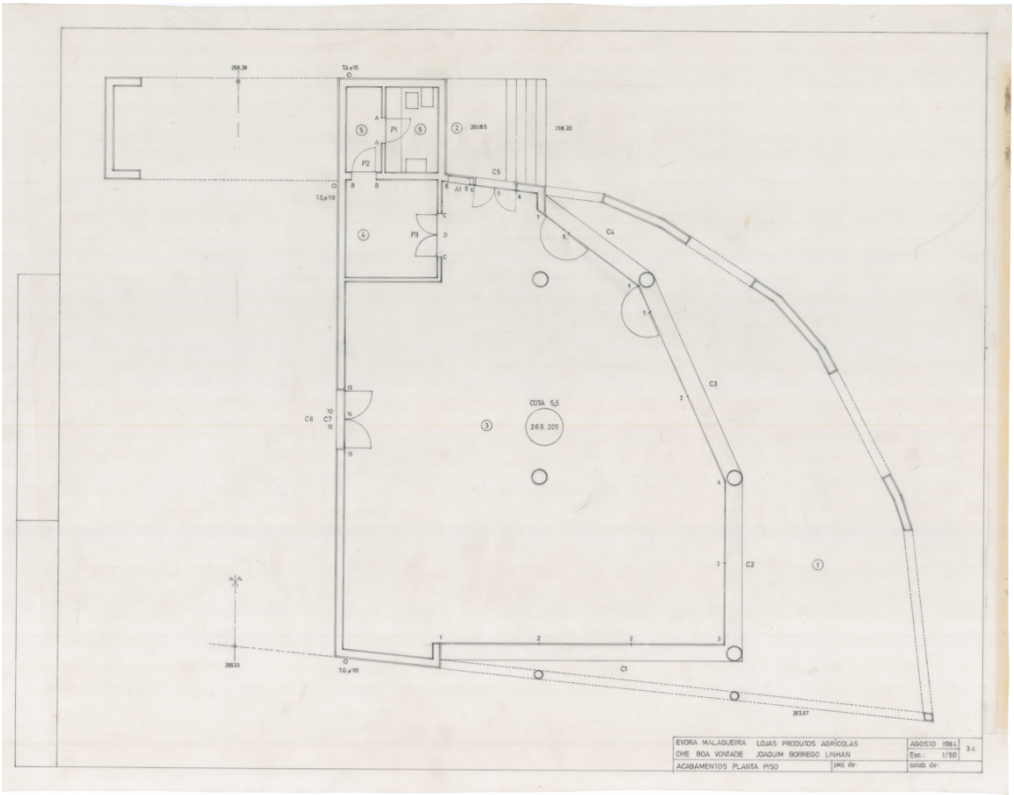

Figure 83. Interior plan, organic market. By Drawing Matter.

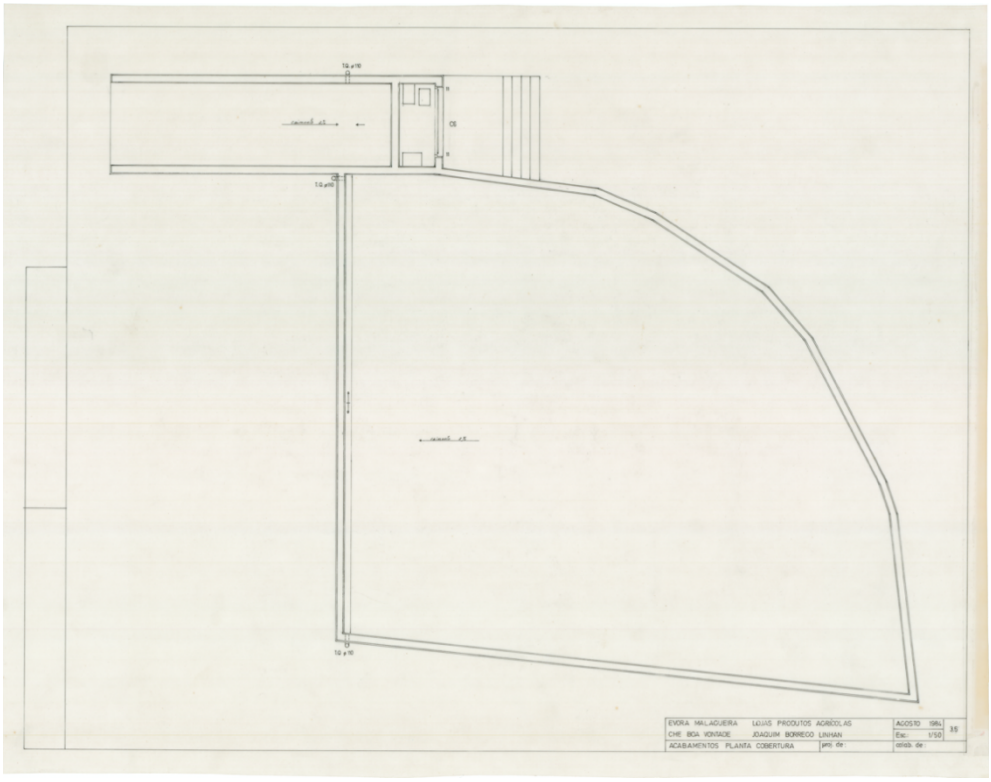

Figure 84. Roof plan, by: Drawing Matter.

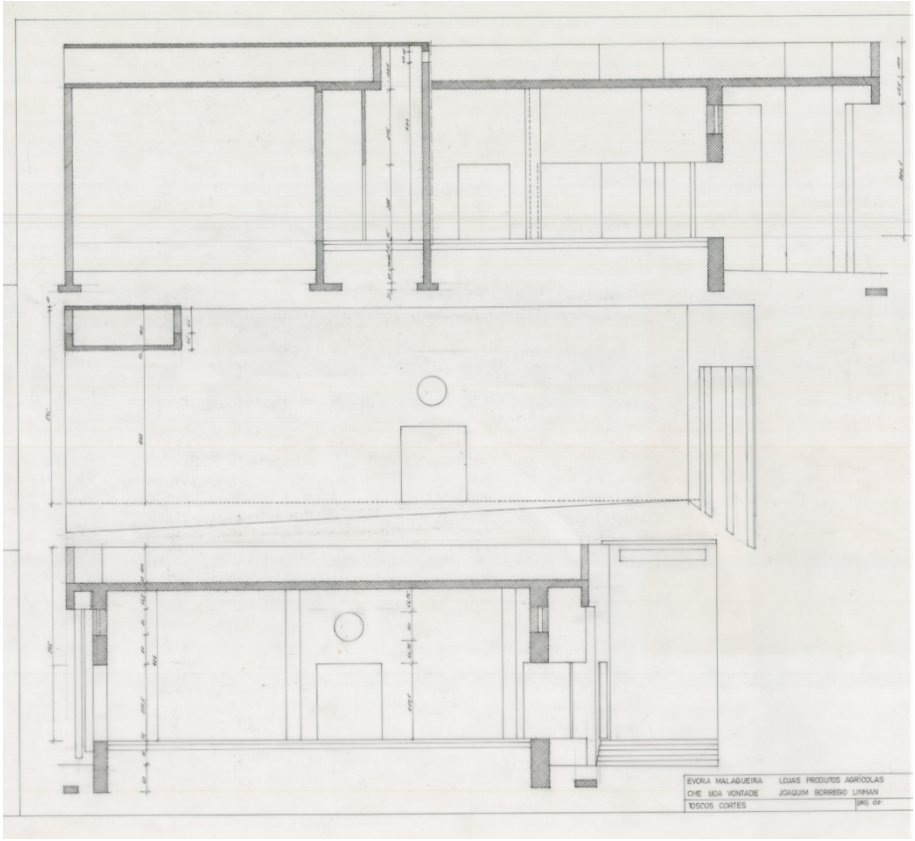

Figure 85. , conduct section, building side view and transversal section, by: drawing matter.

Trying to continue Siza´s design principles, I maintain esthetically as similar as possible to the drawings. However, I separate the building´s function into two individual structures,Figure 86. Which I identify as the straight volume as the coworking, and the curved one as water reservoir.

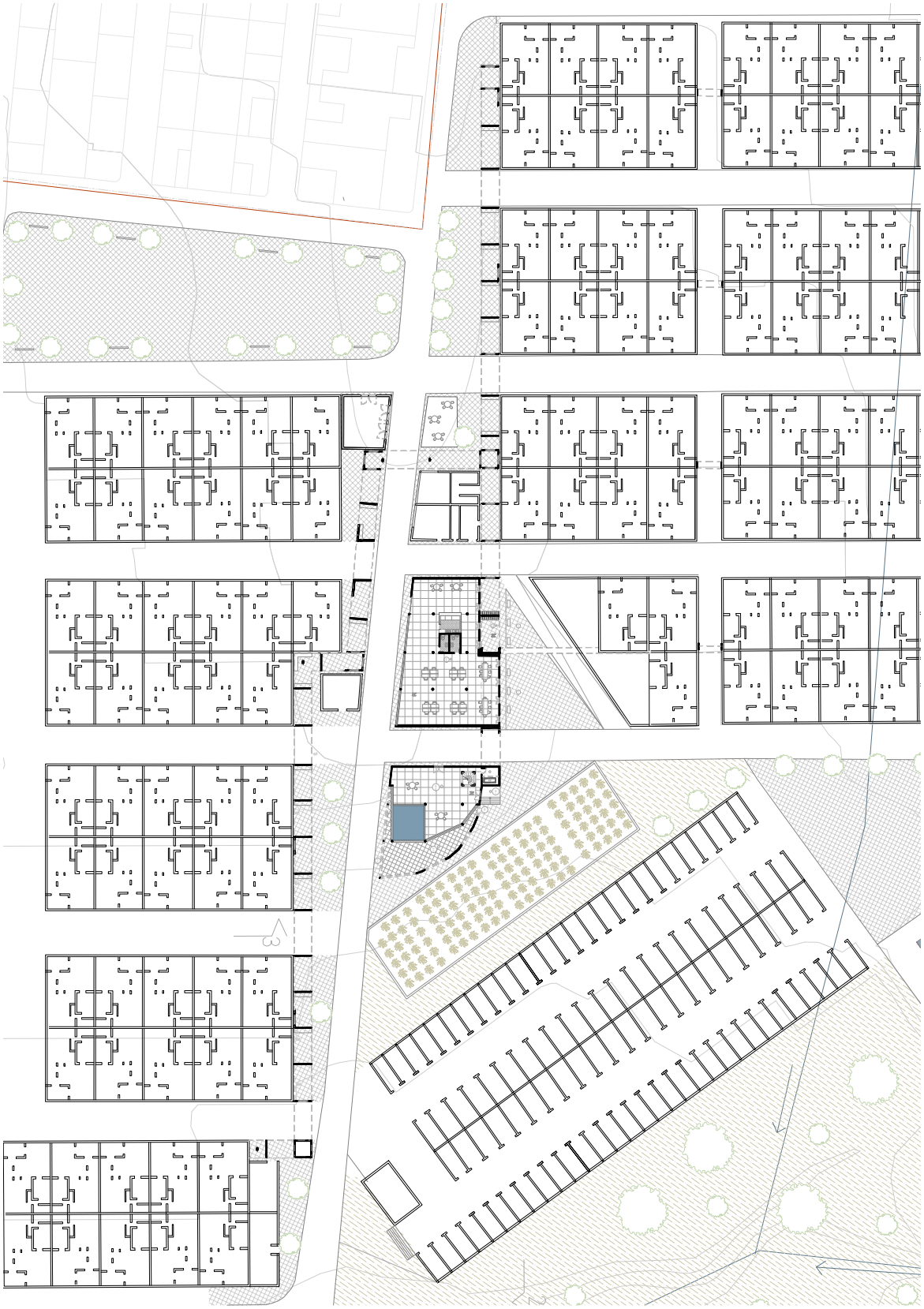

Figure 86. ground level of the complex, by: author.

Coworking building.

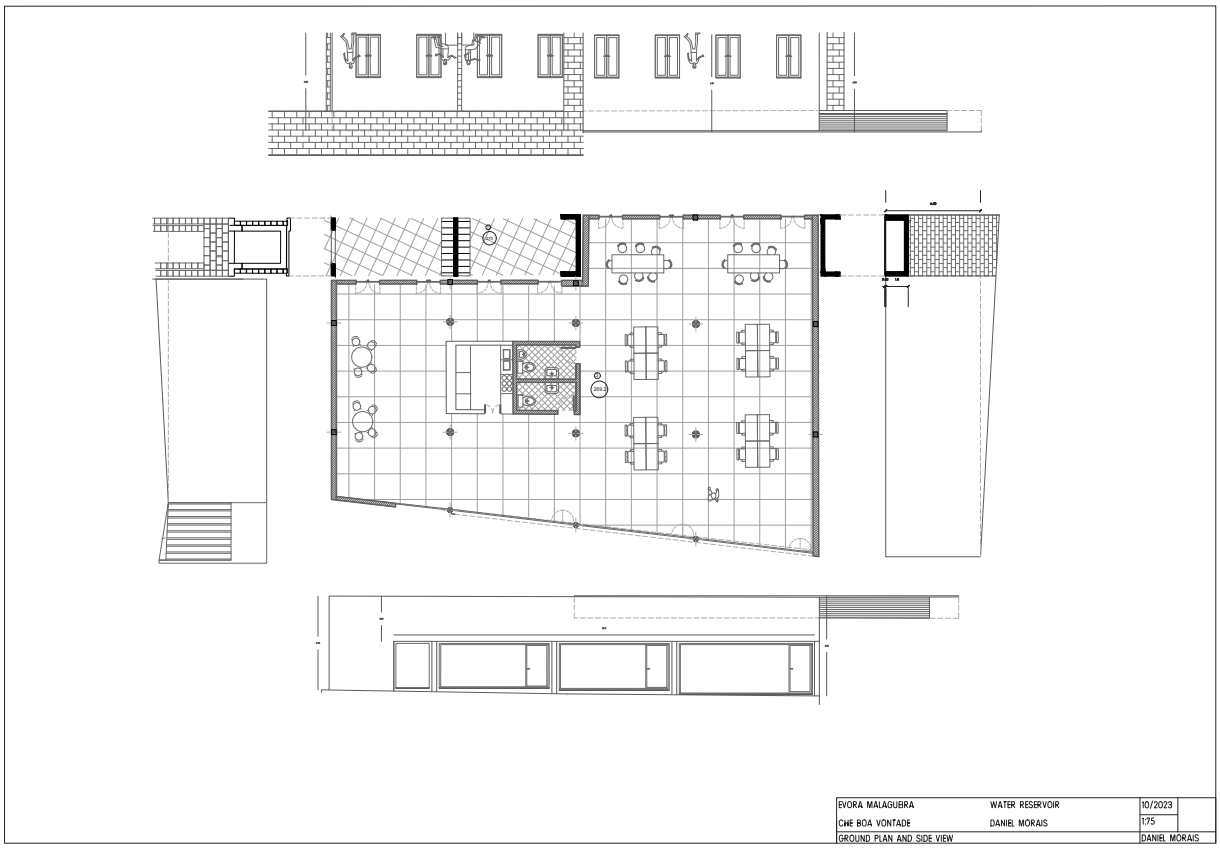

Figure 87. Ground level and side view, coworking building. By: author.

The straight building works as a coworking area and café, designed for students or remote workers. Its entrance is made below the conduct and its structure adapts the same metric of the conduct pillars. Figure 87

It has a brute area of 260m2, while 215m2 area useful area, and 23m2 is occupied as a service block for bathrooms and the cafe bar.

The building walls also work as the conduct extension pillars, this new extension of the conduct was designed by Siza in white materiality, I assume in plaster as the public route of the structure. This intention of create continuity between the two buildings.

The transversal continuity ensures the horizontal circulation of airflow in the building.

The interior area is organized by the 6 center pillars, in-between them is located the services block with the café bar and the restrooms. This block was designed to be an individual volume in the space. Figure 88

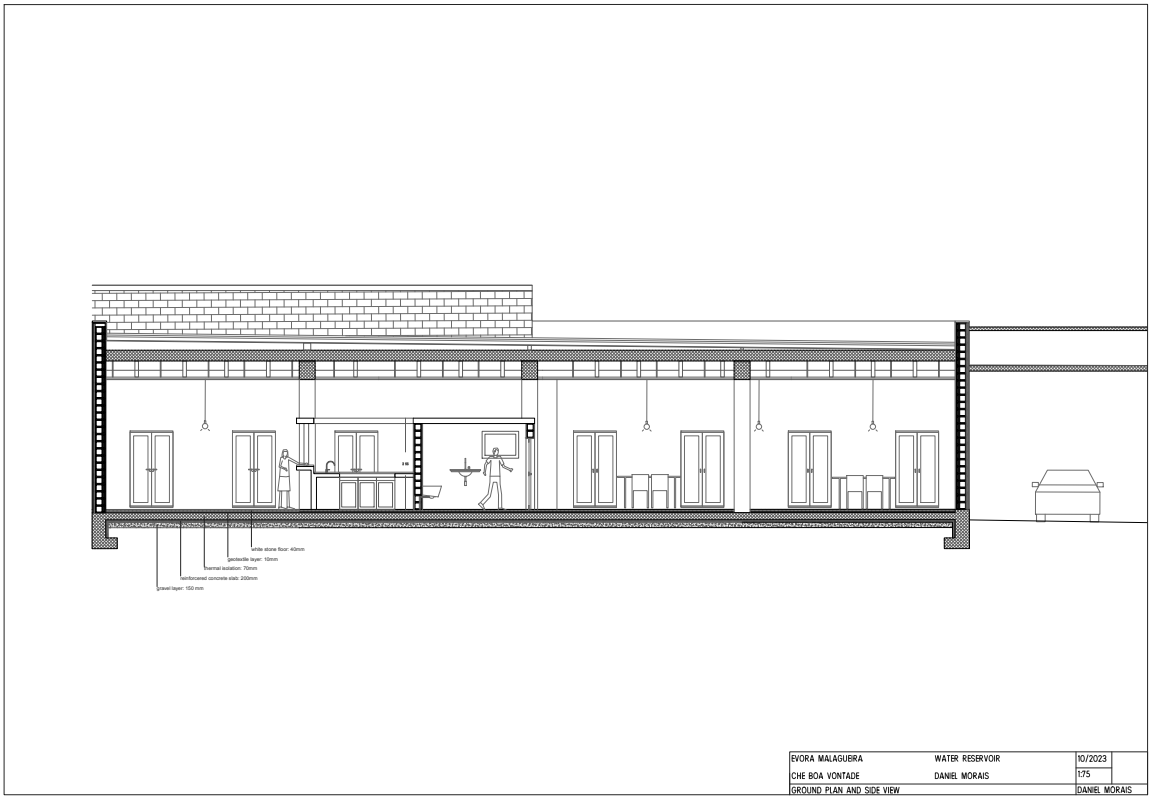

Figure 88. section 1: conduct and interior, section 2: pillars, section 3: services blocks. By author.

Water reservoir.

In the other hand, the previous organic market is going to be a water contemplation space, looking to transmit peace and calm with a water mirror and the view of the green areas of the complex. This volume aims to have symbolic meaning as it introduces us to the roof with a concrete spiral stair.

This access to the roof was designed as a final mark point where the public can be at the highest level of the service structure. A desire that Siza expresses in his early drawings. Figure 47

The stairs are inserted in the conduct extension space, pointing limits of interior and exterior space.

This building brings the meaning of water as a conceptual element in the neighborhood. Making it the protagonist of the space with a water mirror in the interior area. Complementing a space dedicated to calmness.

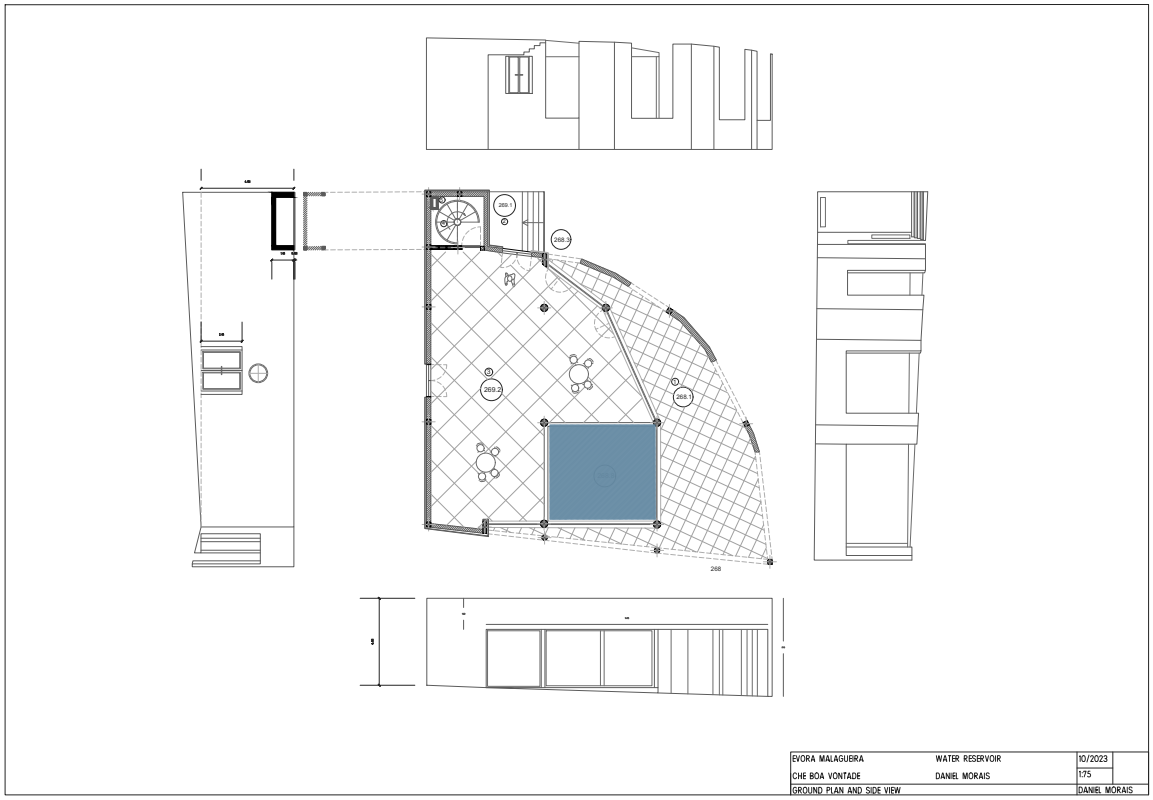

Figure 89. Water reservoir ground plan and side view. By author.

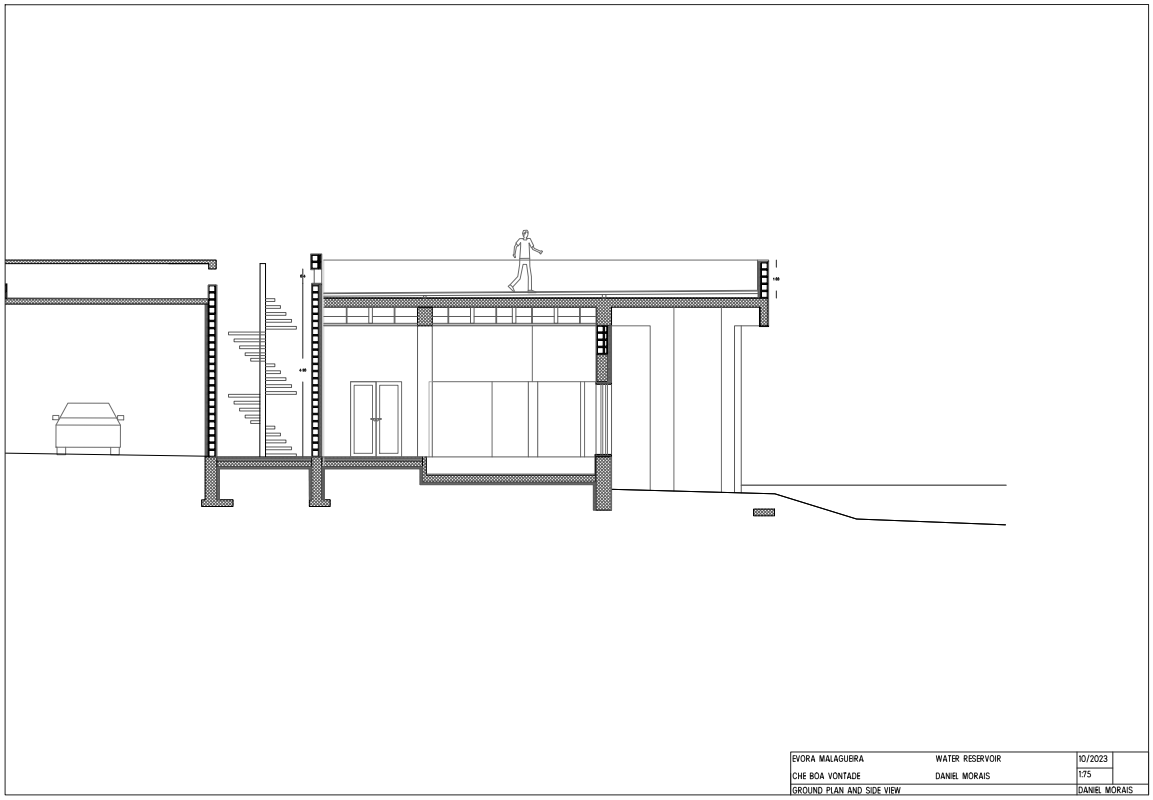

Figure 90. Stair and water mirror section. By author.

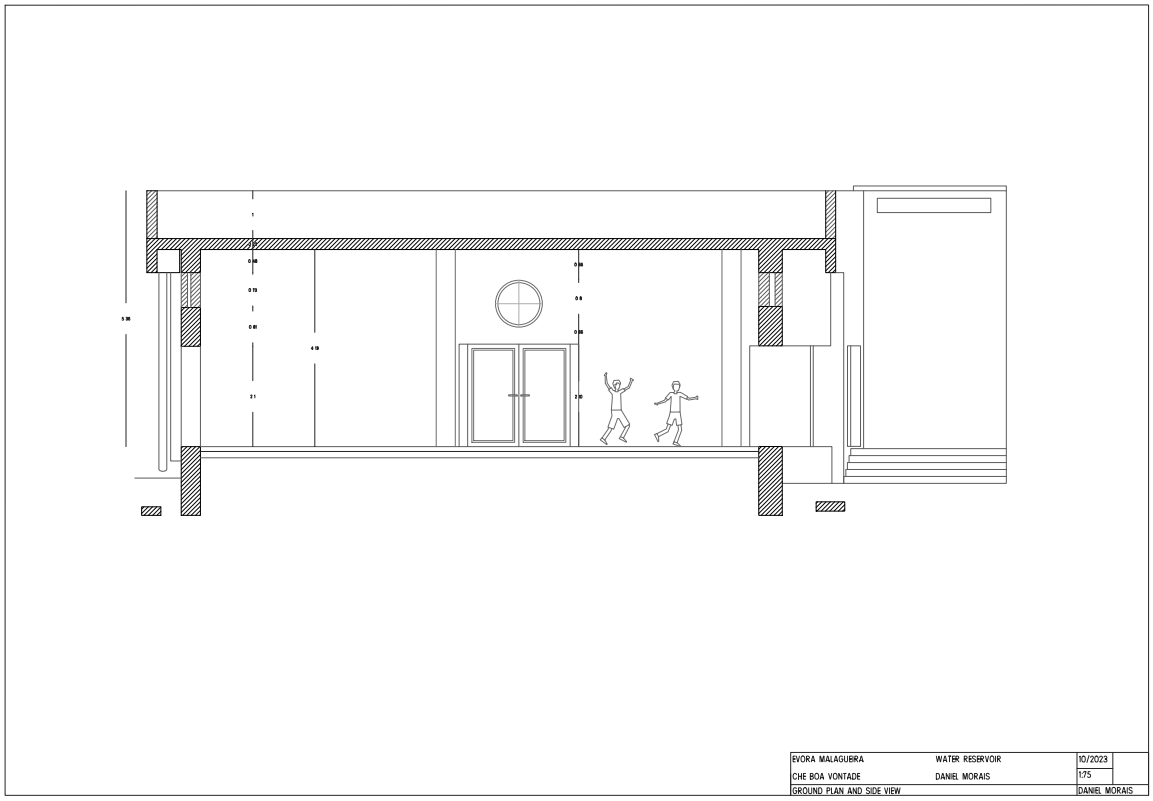

Figure 91. perpendicular section. By author.

Complex.

The new intervention, complemented by the existing public spaces creates a public complex with educational and recreative functions. Which integrated completes the conduct structure planned by Siza.

There is a stronger relation between Santa Maria and Malagueira, and this intervention incentive the use of public spaces.

The rehabilitation project for this urban void was intended to restore Siza's original intention of giving continuity to the Bairro de Santa Maria and creating links with the Malagueira neighborhood.
This continuity was foreseen in the design of this section of the duct, with pillars arranged perpendicularly, adjoined by benches, creating moments of stopping and sitting, instead of passage between porticoed supports.

A square with trees is created in front of the coworking and curved volume. This square creates a seating area on the opposite sidf St Maria's square, matching the layout of pillars thpillars in the duct: on one side the benches face St Mary's square, on the other they face the "water" treatment square.

An alignment of trees also creates a relationship with the next square in front of the lake garden.

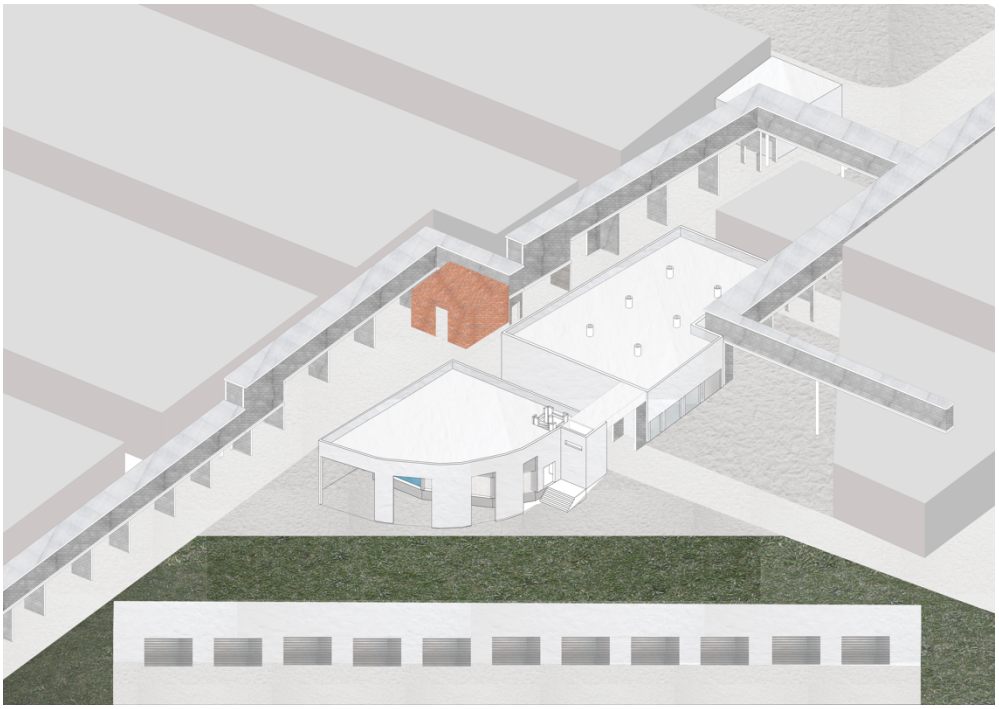

Figure 92. complex materiality, by author.

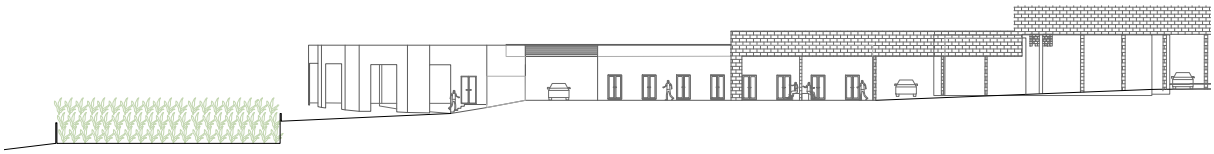

Figure 93. north side, complex. By author.

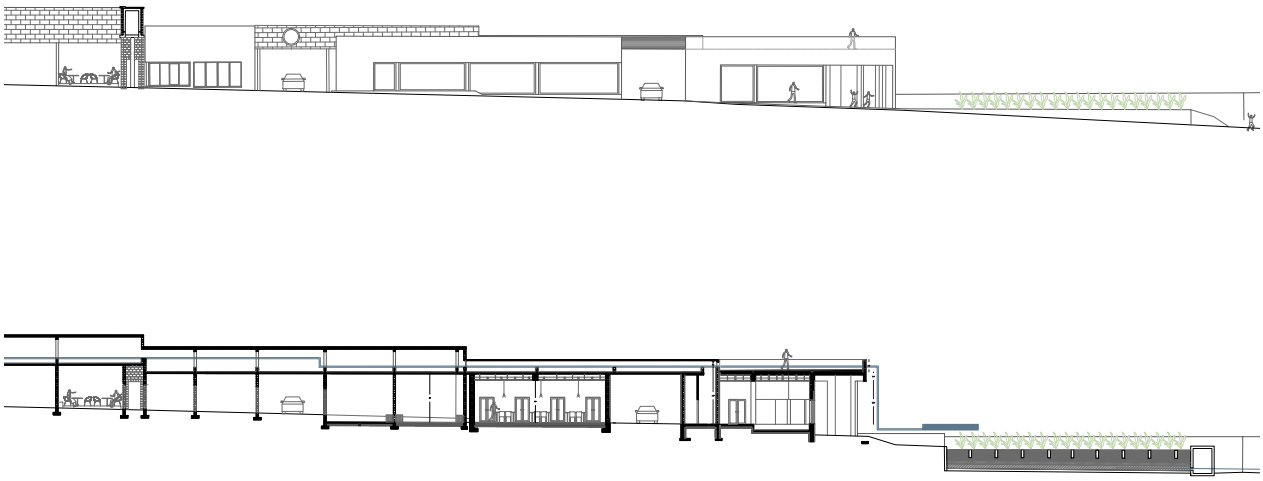

Figure 94. south side, complex. By author.

Treatments Tanks.

After the treatment water process, the idea is to re-introduce the water in the conduit using the new construction and the extension which was already designed by Siza. Figure 79

Besides being a natural solution for a problem, allows their spaces to be used at every moment. These characteristics help the conception of the space.

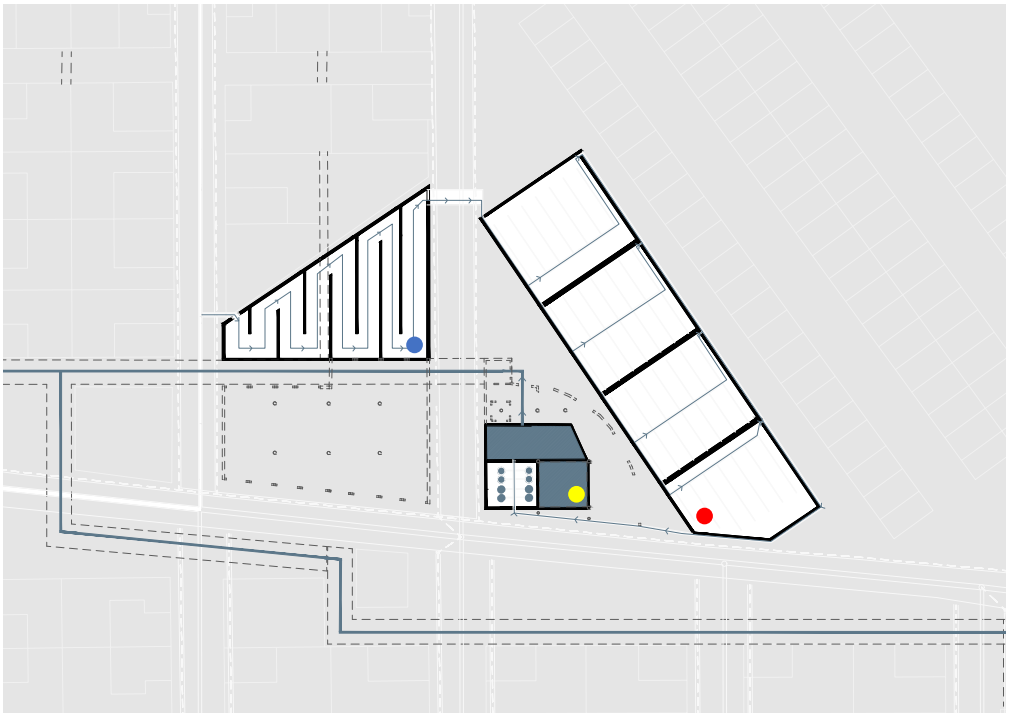

Figure 95. tanks design plan view in order: 1st: blue, 2nd: red and, 3rd: yellow. by author.

The different tanks represent every stage of the treatment. While all of them are located underground, only the last stage has a direct connection with the buildings creating a water mirror. Figure 89

The tank 1º (blue) is in the exterior areas of the straight building, this tank is a system of the preliminary treatment and the first phase. The public space is going to be the tank surface, creating a flat space that could be used as exterior space.

This space is limited with the residential block, the tank shape helps adapt to the typology and creates two areas perhaps with 1.2m difference.

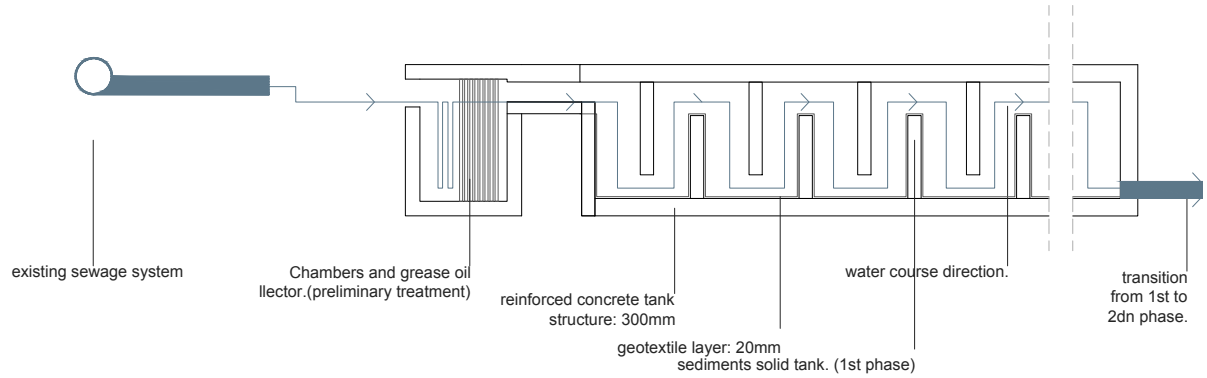

Figure 96. 1º phase section. By author.

The 2º tank (red) of the treatment process is the planted bed of wetland vegetation. This bed is a tank with a biological system that works as a natural cleaner. Is the largest of the system because of the extension needed for the plantedbed.

The tank design is parallel to the parking lot, creating a green space, limited to the street and the reservoir exterior area. The tank area isn't walkable but the surrounding green area is.

The third phase is in the reservoir building. It is a combination of three systems, The first is the disinfection unit.

After these systems, the water is distributed for various purposes: for the water mirror (i), for watering the nearby green spaces or for domestic use, pumping it up to level 2 of the duct for distribution to the houses.

This water distribution makes a tribute to the water in the project of Malagueira, bringing the water physically to the interior space. with the water mirror.

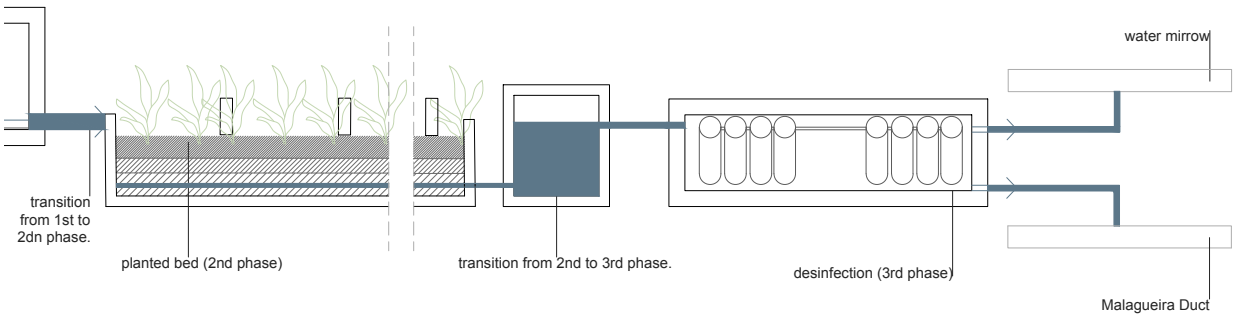

Figure 97. 2º and 3º phase section. By author.

Summary.

The water tanks create spaces that can be used as public areas and bring higher interest from the residents. These spaces hopefully help people to have a bigger community life and a better one.

The constructed area in the project is the result of an adaptation design of a water treatment plan into an architectural non-constructed project. The results come after a research and practical project during the 5th year of Architecture School.

The adapting process is a highly challenging one, the high level of detail to have the project consolidated and approved is difficult. But the process of learning and trying new ideas and discussing them with professors and students is the part where we learn the most.

The new complex adds so much value to the neighborhood and is an important way to develop innovative solutions for Sustainable Rehabilitation.

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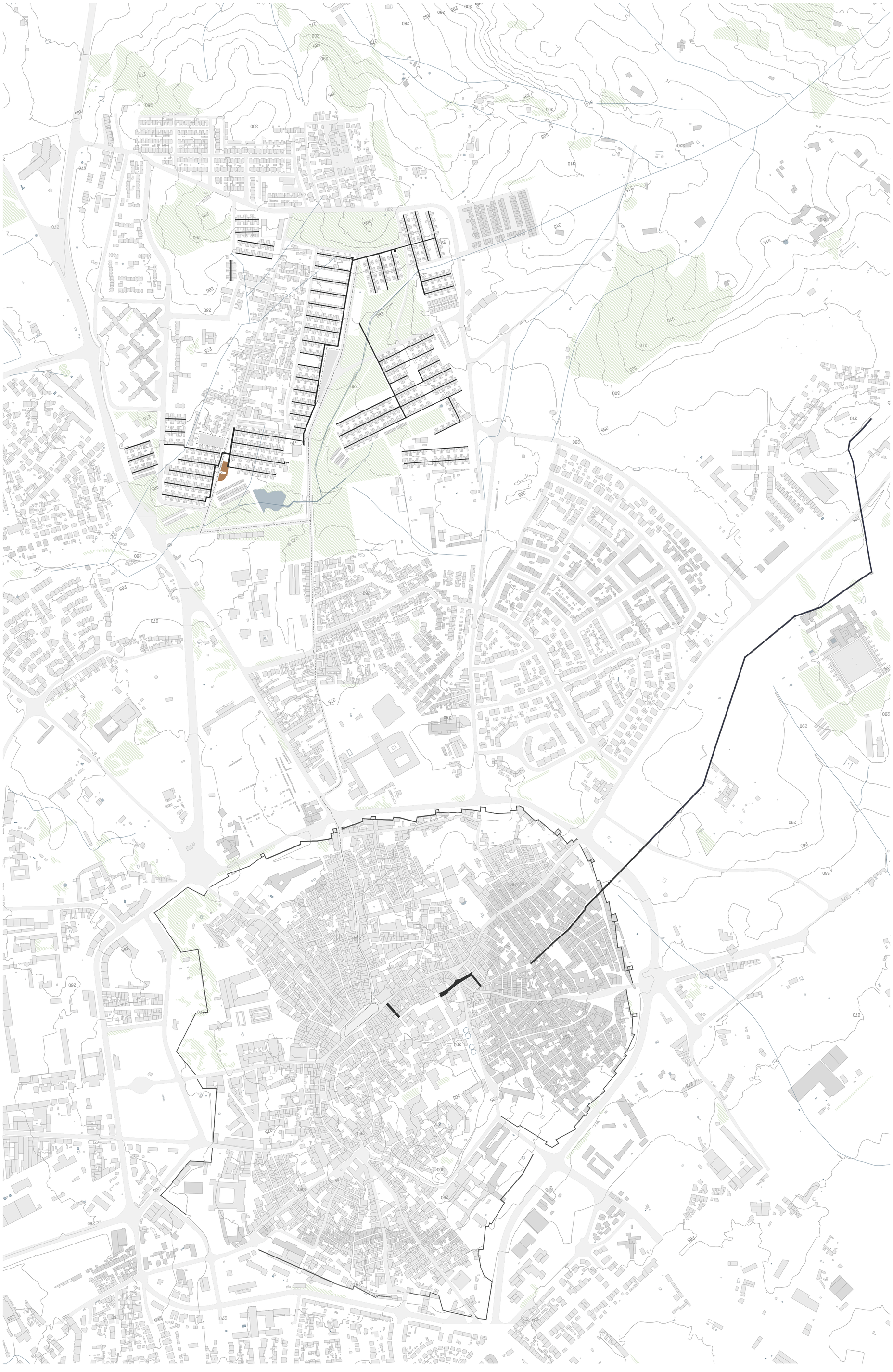
Figures

Rehabilitation of the Malagueira Neighbourhood

The conduct, public space, and water

scale 1:5000



Conduct and Aqueduct.

Green spaces.

Watercourses.

W/E and N/S axis.

Constructions

Roads

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Novembro 2023

Rehabilitation of the Malagueira Neighbourhood

The conduct, public space, and water

scale 1:1500

1

2

3

4

5

6

1

2

Conduct:

Conduct Oppenings

White Plaster

Concrete Block

Mark points:

Intervention Site

Elements Never Built:

1. Broadway 2- 1983.

2. Restaurante Casa de Chá. 1986.

3. Associação Orquetra de Acordeoes de Évora. 1988

4. Complexo Paroquial. 1989.

5. Aparthotel 1992.

6. Escola de Linguas. 1992 - Clínica Médica. 1997

7. Semicúpula. 1999.

8. Junta de Freguesia. 2001.

9. Sede da Cooperativa de Boa Vontade. 2005.

10. Loja de produtos agrícolas. 1984. (Intervention)

1

2

3

4

5

6

7

7

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11

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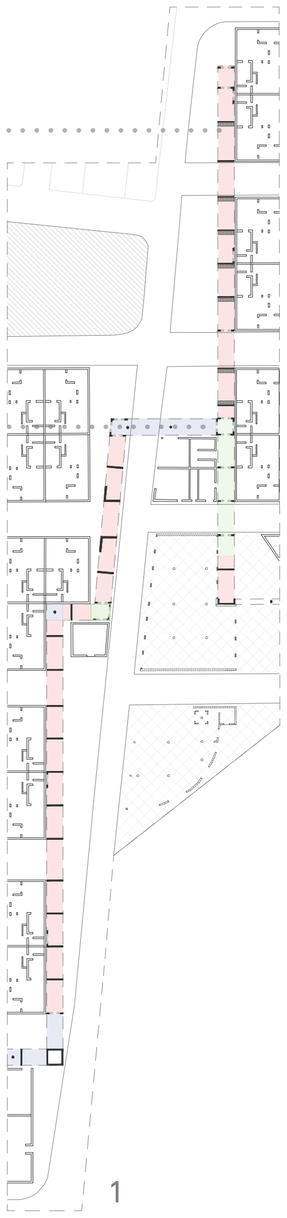
Rehabilitation of the Malagueira Neighbourhood

The conduct, public space, and water

scale 1:600



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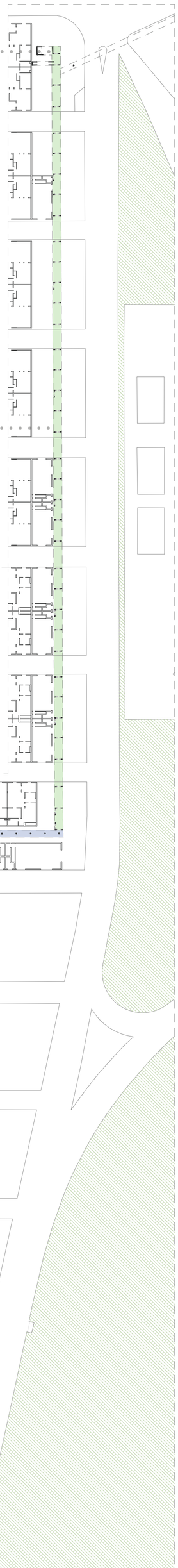

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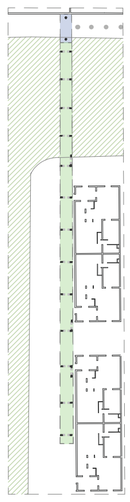
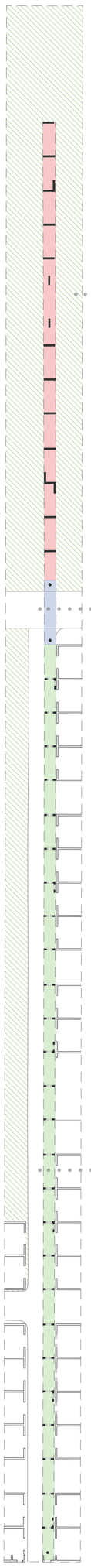


3.1



4

Conduct routes.

The Conduct creates a pedestrian gallery with variation of columns typologies, following the function of the space.

The variation is separed with different colors and all the route are analyzed as it is directly related with others constructions, from commercial to residential ones.

This relation comes from the pillars form.

The typologies are divided into a, b, c, d.

Besides the pillars the strcuture also complements the public space with urban furniture.

a. Paralel Pillar:

Seen only in Praça Zeca Afonso. Creates stop moments with the possibility of passage.

b. Perpendicular Solid Pillar:

They creates spot zones.

c. Perpendicular Portic:

Creates a protected pedestrian route.

d. Columns:

Mark street crosses and intersections.

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Rehabilitation of the Malagueira Neighbourhood

The conduct, public space, and water

Intervention Area

Irregular stone.

White marble.

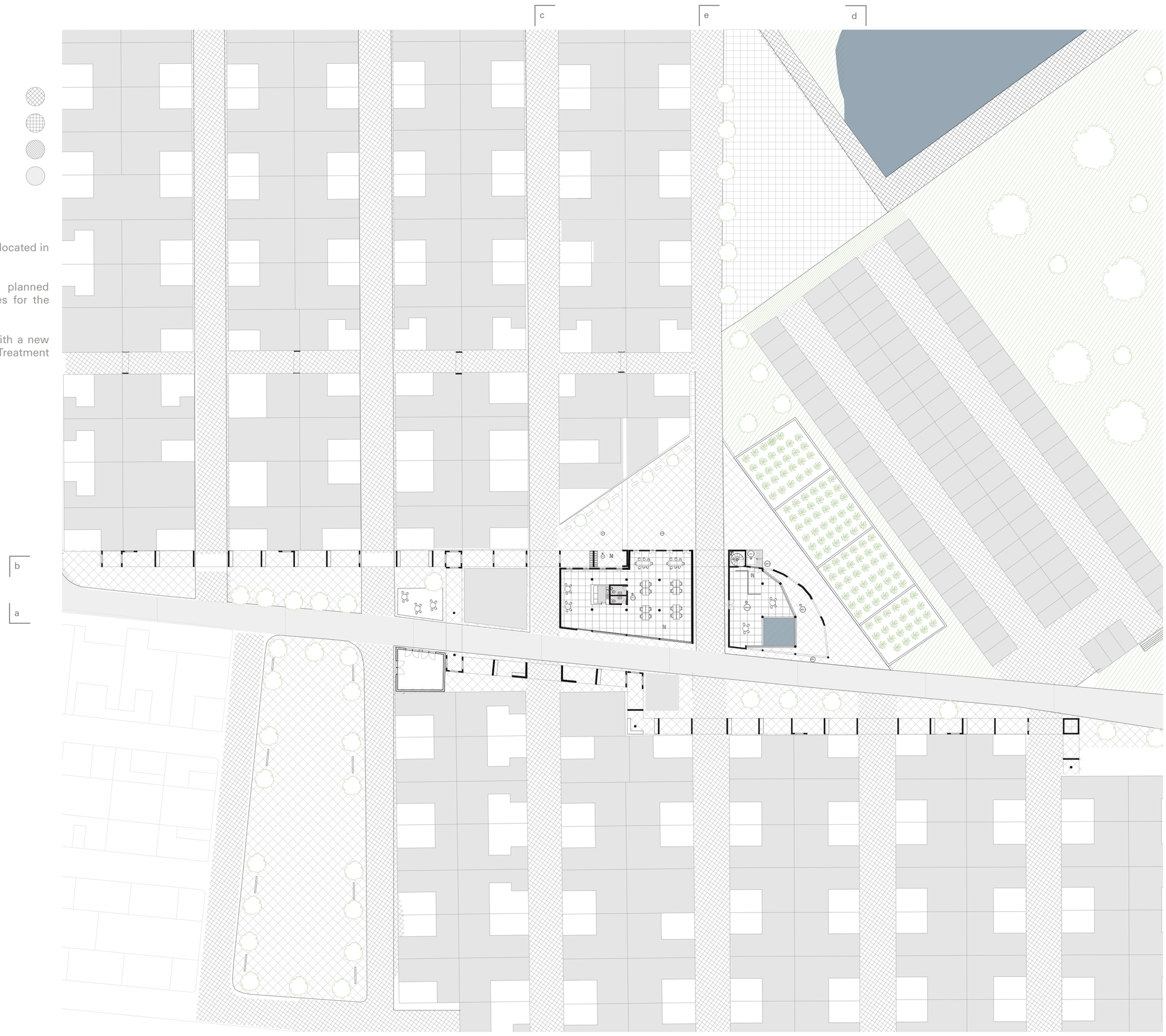
7x7 regular stone.

Asphalt.

The intervention area is located in conduct route nº1.

This urban Void was planned as a commercial spaces for the neigborhood.

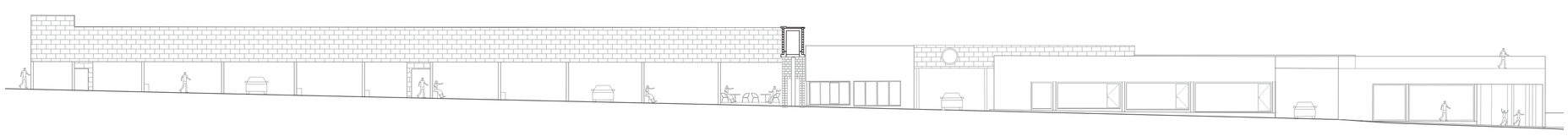
The Space was used with a new function as a Natural Treatment Water Plan .



South street view.

Section a.

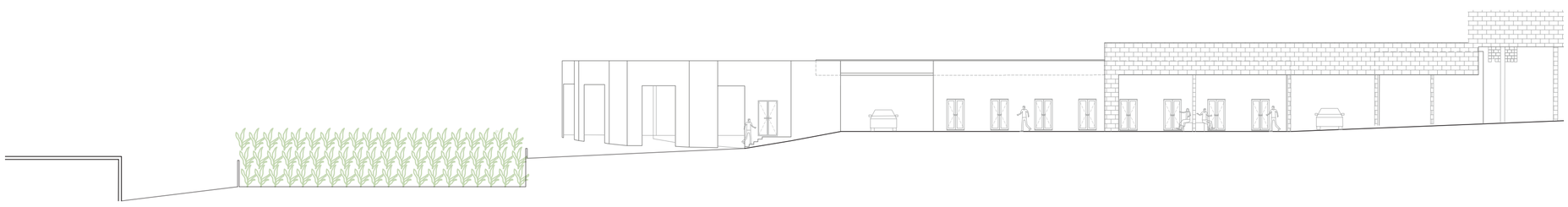
1:200



Water square view.

North side.

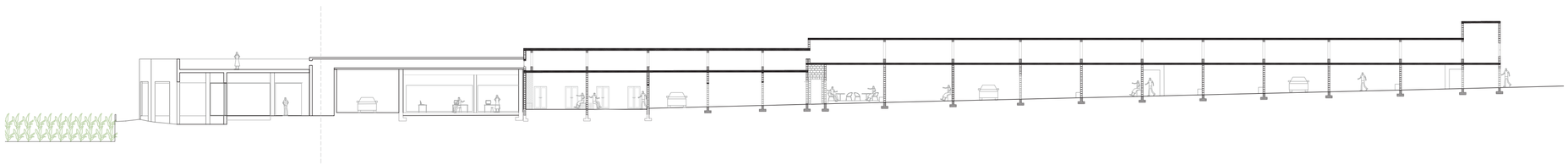
1:150



Conduct and buildings.

Section b.

1:200



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Rehabilitation of the Malagueira Neighbourhood

The duct, public space, and water

scale 1:100

Intervention south view

Santa Maria Square.

Water Square. (new) (1º)

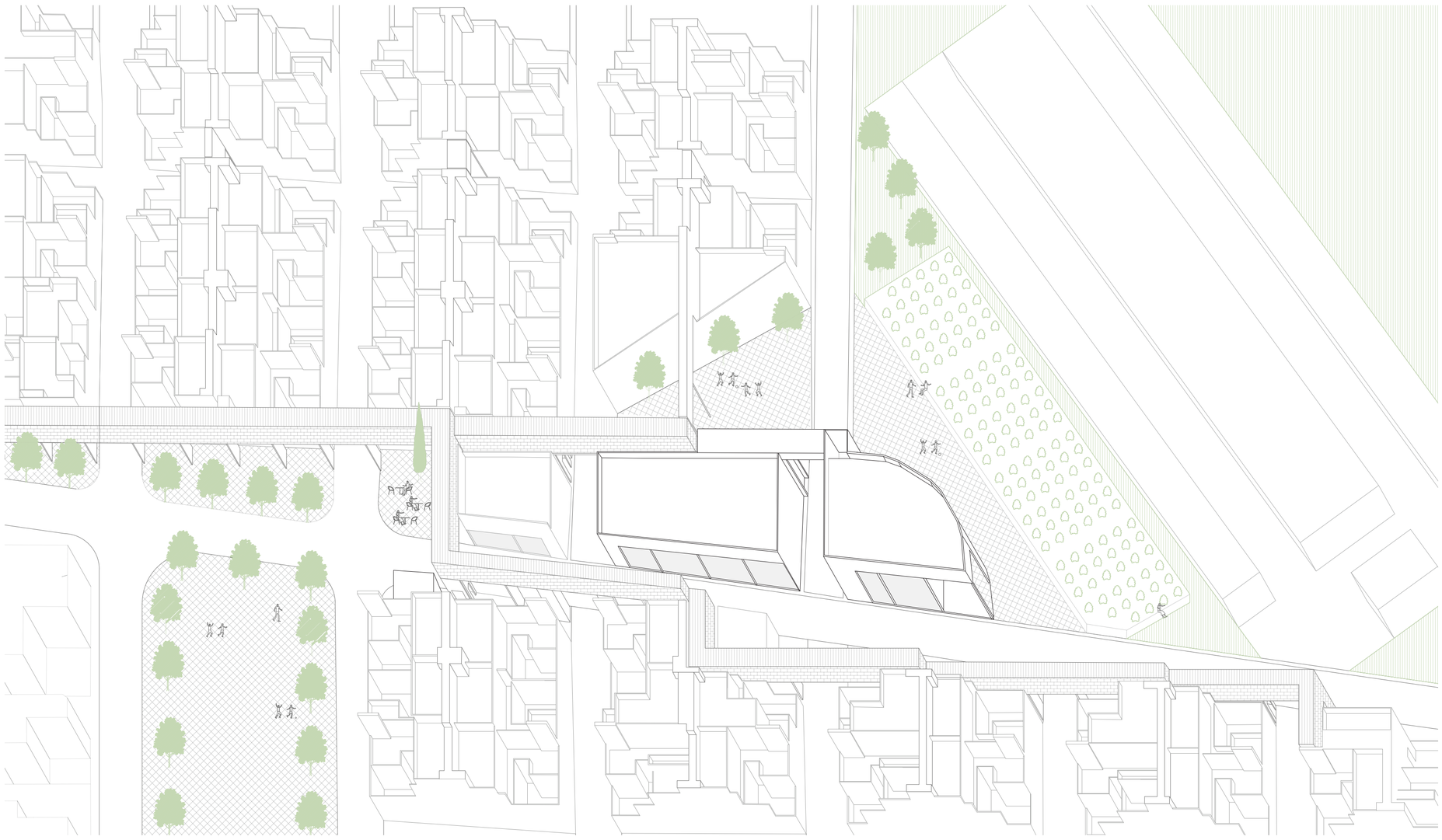
Conduct.

Green public spaces.

Vegetation tank. (new) (2º)

Coworking. (new)

Reservoir. (new) (3º).



Treatment tanks.

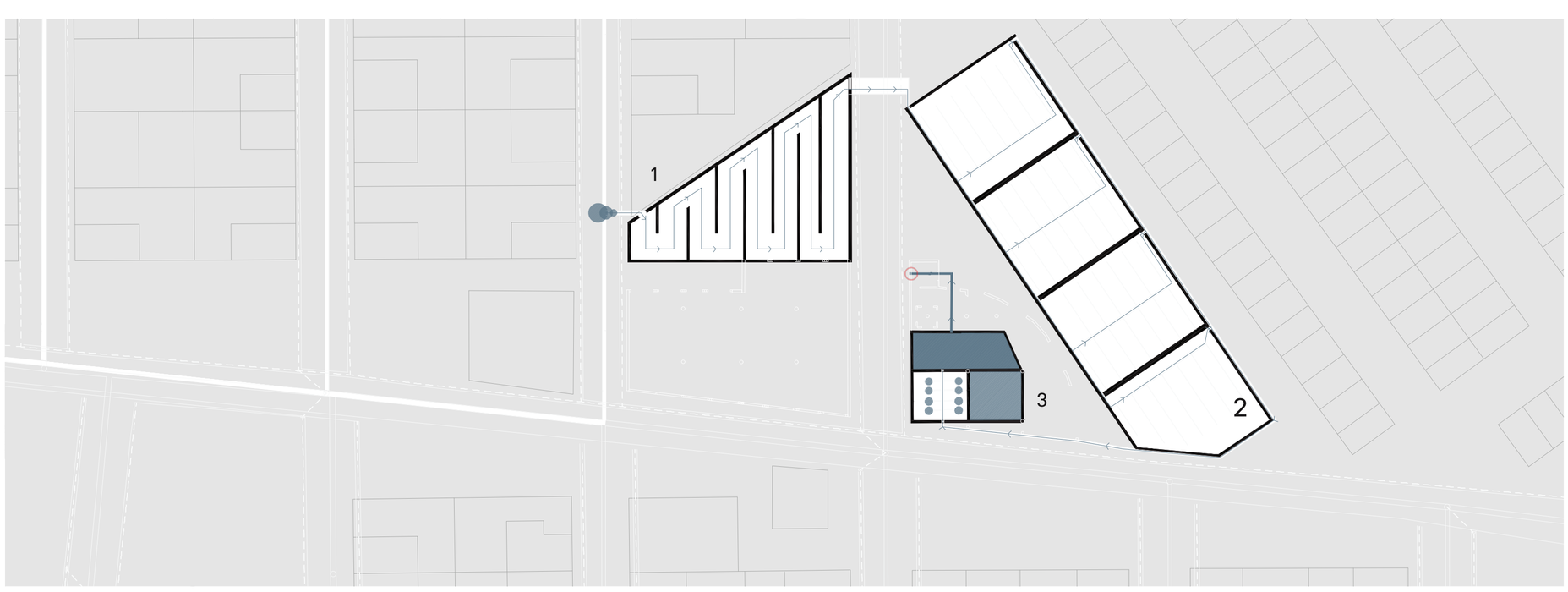
1º phase:
Sediments Solid Tanks.

2º phase:
Plantted Bed.

3º phase:
Desinfection.

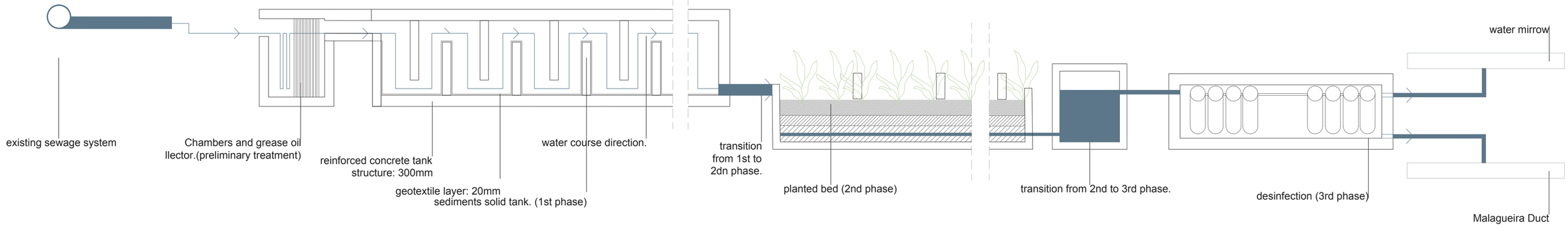
Water entrance into the first tank.

Re-introduction of the water in the conduct after 3º phase.



Water Treatment System

(IWT)



1º phase. 2º phase. 3º phase.

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Rehabilitation of the Malagueira Neighbourhood

The conduct, public space, and water

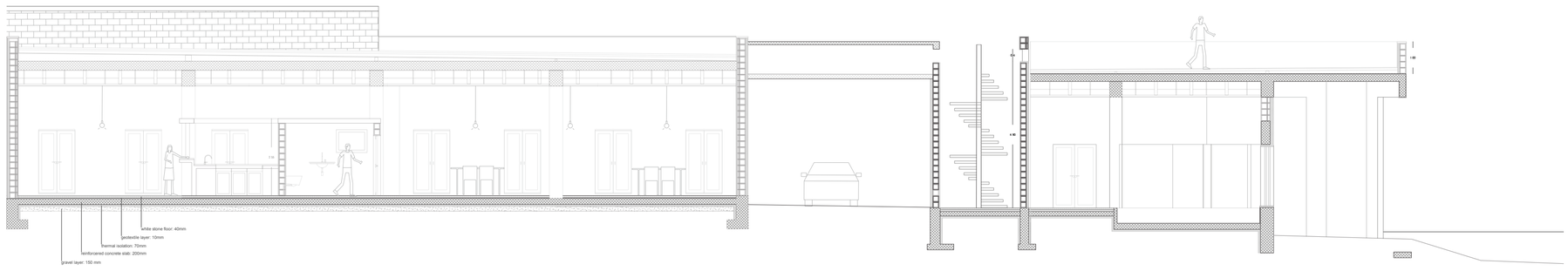
scale 1:50

New Building Section.

Construction system.

Conduct extension.

Roof access.



Interior Materials:

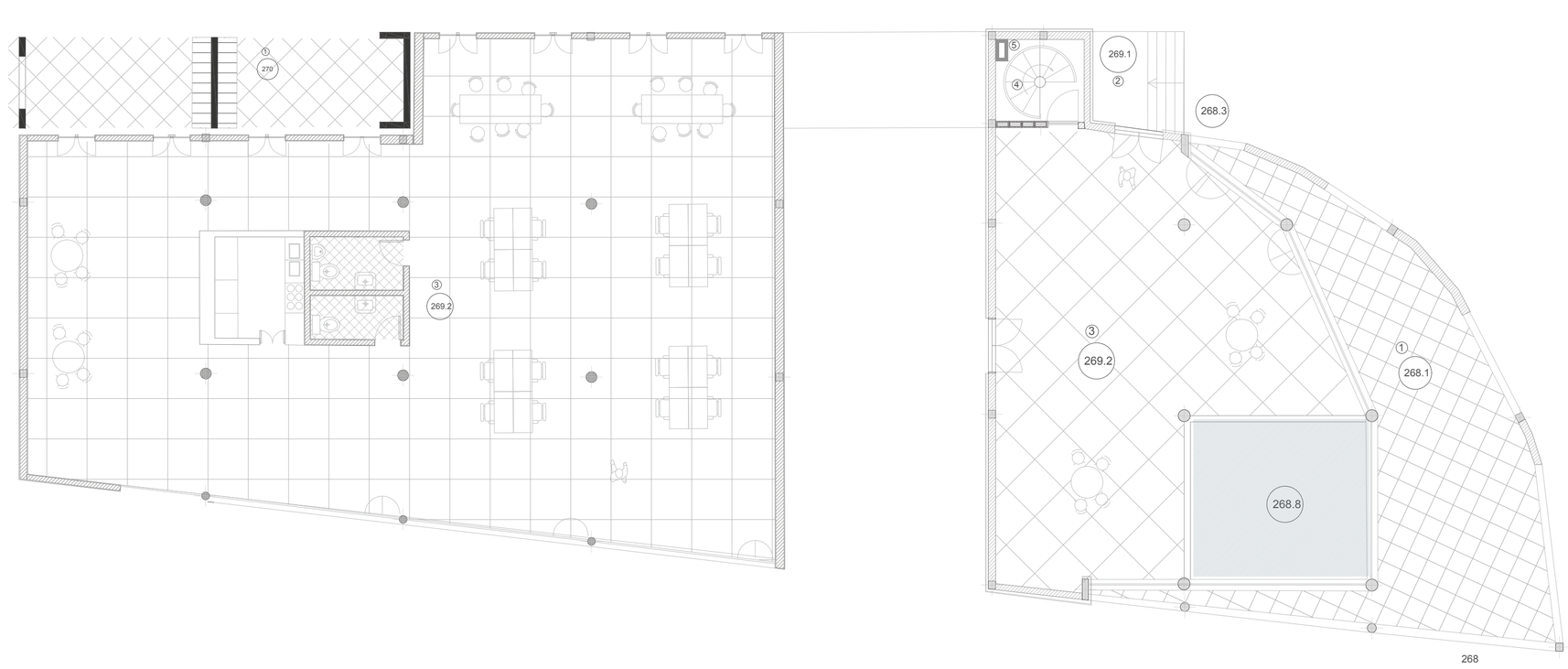
1. Irregular Stone.

2. Stone.

3. White Marbel Stone.

4. Ceramic.

5. Water re-entrance.

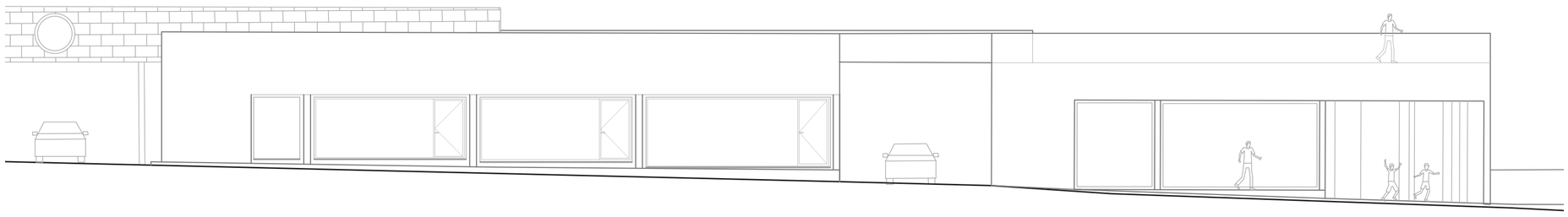


New Buildings:

Santa Maria St. view.

South side.

1:75

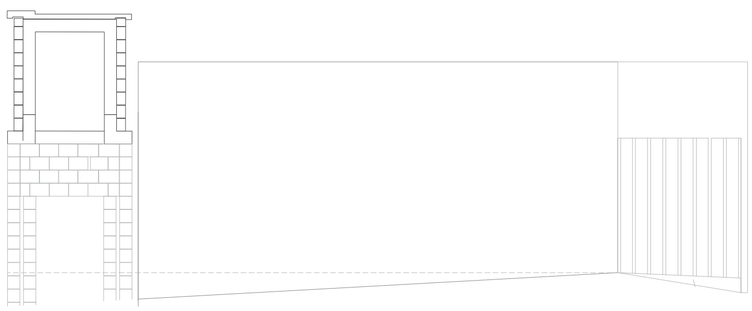


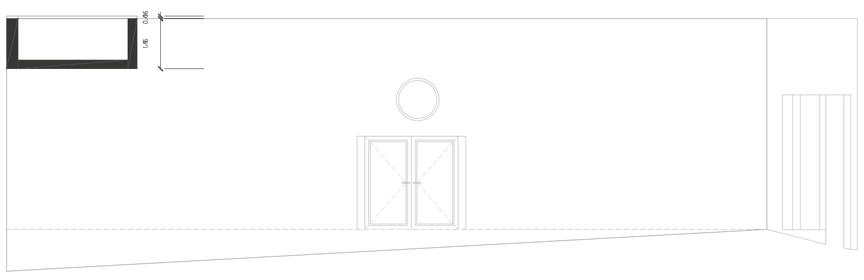
Coworking.

Section c.

West side.

1.50





Water Reservoir.

Entrance.

Section e.

West side.

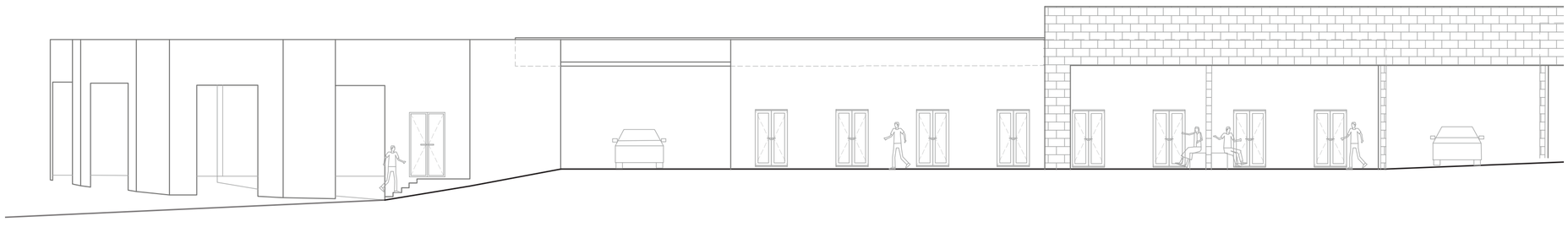
1.50

New Buildings:

Water Square view.

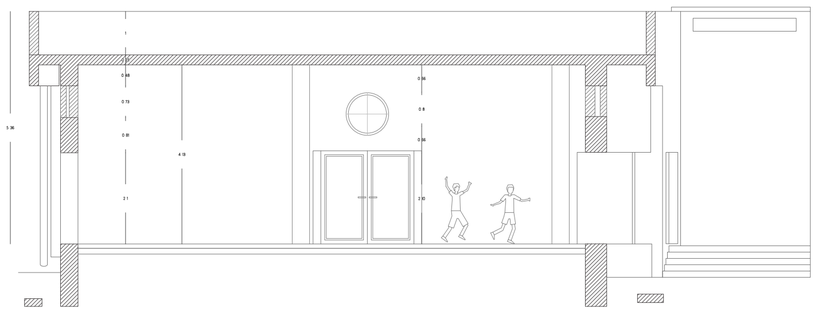
North view.

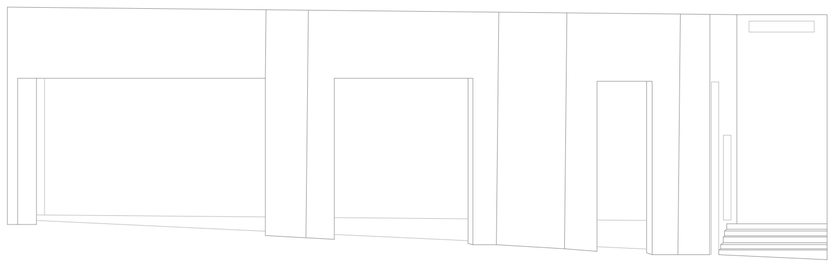
1:75



Reservoir interior.

1:50





Reservoir.

East side.

Section d.

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Novembro 2023